The Past and Future of Quantitative Asset Management

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Value and momentum strategies have worked since 1990, perhaps even as far back as 1926. But combined, they are even more effective, and the results are unlikely to be arbitraged away in the near term. A combined value/momentum strategy can be applied not only to stocks but also to bonds, currency, and commodities.

I am a quant. I believe in what we do, and I believe that the future is bright for quantitative asset management strategies. In this presentation, I will discuss the difference between quantitative methods and what I will call "qualitative" methods, even though I realize that qualitative is not an accurate descriptor. I believe, however, that it is better than any of the other labels for nonquantitative managers, such as active, fundamental, or intuitive—all of which can be used to describe at least certain aspects of quantitative management. I will present some simplified portfolio structures followed by basic empirical evidence on quantitative management. I will also identify some of the challenges facing quantitative methods post-August 2007, describe some of the pitfalls facing the implementation of quantitative methods, and discuss some scenarios for the future.

What Is Quant Asset Management?

Many people believe that quantitative asset management is all about numbers, and it is true that judgment and intuition do not play a big role in a quant portfolio, particularly on a daily basis. But in model construction and in process and risk control construction, sound judgment and intuition based on years of experience play a surprisingly important role in quant management. The defining element in quant management, however, is diversification. Good quants play a statistical game. They do something that works based on an average tendency. So, the advantage of quant management is that the manager does not have to make a big bet on any one position. Its disadvantage is that quant managers tend to know far less about any given situation than qualitative managers do. The flip side of this disadvantage, however, is that if qual managers expect to stay in business, they need to be right when they make a choice because they tend to take on a lot of risk in any given situation.

I once overheard a conversation that I think exemplifies the difference between the qual and the quant worlds. During the day, I was working trading fixed income (and in the evening, writing my dissertation), and one day our qual manager came up to our quant manager and said, with obvious excitement in his voice: "We just added Philip Morris at maximum weight. We never hold anything at maximum weight, but we did all the analysis, and we're very enthusiastic. We think Philip Morris has taken a beating and will come roaring back. What do you guys think?" The quant looked at him and said: "You know, I'm not sure if we're long or short." For me, that exchange summarizes the difference between the two methodologies.

Certainly, it is not necessarily bad for quant managers to know their positions on individual stocks, nor is it unreasonable not to know those individual positions because the motivating idea behind quant methods has little to do with individual stocks and everything to do with central tendencies and diversification. Qual and quant managers

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simply operate in different spaces. One bets on factors; the other bets on tendencies. Some quals are good at what they do, and others are not so good. The same applies to quants. Years ago, I used to roll my eyes when I would hear qual managers talk about "value plus a catalyst." Now, when I hear myself talking about "value plus momentum," I realize that the differences are perhaps a matter of perspective. Qual managers simply size their bets and their level of knowledge differently from the way quant managers do.

Two Simplified Quant Models. To get more specific, consider **Exhibit 1**, which presents a grossly simplified example of a value long–short portfolio and a momentum long–short portfolio. Such a portfolio containing only five stocks would, of course, never exist in the quant world, where the methodology requires hundreds, even thousands, of securities to be successful. But this simplified example meets my current purpose. So, imagine a simple world with stocks of only five companies: Companies A, B, C, D, and E. I know the price-to-book ratio on each stock and the one-year price momentum on each stock. If all stocks have the same beta, someone managing a value market-neutral portfolio will typically short the highest price-to-book and go long the lowest price-to-book stocks. A momentum long–short portfolio follows basically the same pattern—long the strongest momentum, short the weakest momentum. Therefore, the value long–short portfolio would be designed as shown with Company D at –2/3, Company A at –1/3, Company C flat, and so forth. The momentum long–short portfolio would follow a comparable pattern based on its internal logic. If we assume that, in reality, there are many more stocks with an average value effect and an average momentum effect than five, then managers who control their risks and costs can probably expect to make money over the long term in both of these portfolios.

A basic premise of investment management, but one that is particularly applied in quant management, is that if two good strategies are negatively correlated, they are better in combination than they are separately. If I follow that premise in the case of these two portfolios and give half of my money to each of the two managers, the result will be the 50/50 combo portfolio at the bottom of Exhibit 1. Because only five stocks are involved, the combined portfolio, which is long two stocks and short one, is rather silly looking. But if the portfolio consisted of 500 stocks long and 500 stocks short balancing each other, it would offer a far more attractive picture.

Value and Momentum and Quant Methods. Value and momentum, of course, are not the only means of organizing a quant portfolio. Many measures do not fit neatly into value and momentum anymore. The world has grown wider than that. For example, managers can give more or less weight to various factors at various times, or they can construct portfolios based on industry exposure. But the basic premise of juxtaposing two such good but uncorrelated long–short portfolios is generally quite applicable.

Academics are still struggling to explain the reasons for the success of value and momentum investing, but the case is generally reduced to the following propositions:

- Value is a risk factor and is thus consistent with the view that markets are efficient.
- Value and momentum are mispriced factors. Therefore, they constitute anomalies, which is consistent with the view that markets are inefficient.
- Value and momentum are entirely reliant on data mining and occur only because of unusually efficient researchers.

Exhibit 1. Designs for Three Simplified Quantitative Portfolios

	Company				
	A	B	C	D	E
Measure					
Price-to-book ratio	2.0	1.0	1.5	3.0	0.5
Prior momentum	15%	–5%	–15%	20%	–10%
Sample portfolios					
Value long–short	D –2/3	A –1/3	C flat	B 1/3	E 2/3
Momentum long–short	C –2/3	E –1/3	B flat	A 1/3	D 2/3
50/50 combo	C –2/3	A flat	D flat	B 1/3	E 1/3

I cannot add much about the arguments for risk and mispricing, but I strongly believe that data mining is an unlikely explanation for the success of value and momentum investing.

Consider, for example, **Figure 1**, which shows a cumulative excess return to value—high-minus-low (HML) book-to-market ratios—from 1926 to 2007. HML is the Fama and French version of a value long–short portfolio. Interestingly, many knowledgeable investors argue that a value strategy will not work anymore because everyone knows about it. Yet, according to French's website, the current data closely match the 80-year trend line. This observation does not mean that this strategy will work over any particular week, month, or year, but I believe it will continue to work for now. Eventually, the success of this strategy may be arbitraged away, but we are not there yet.

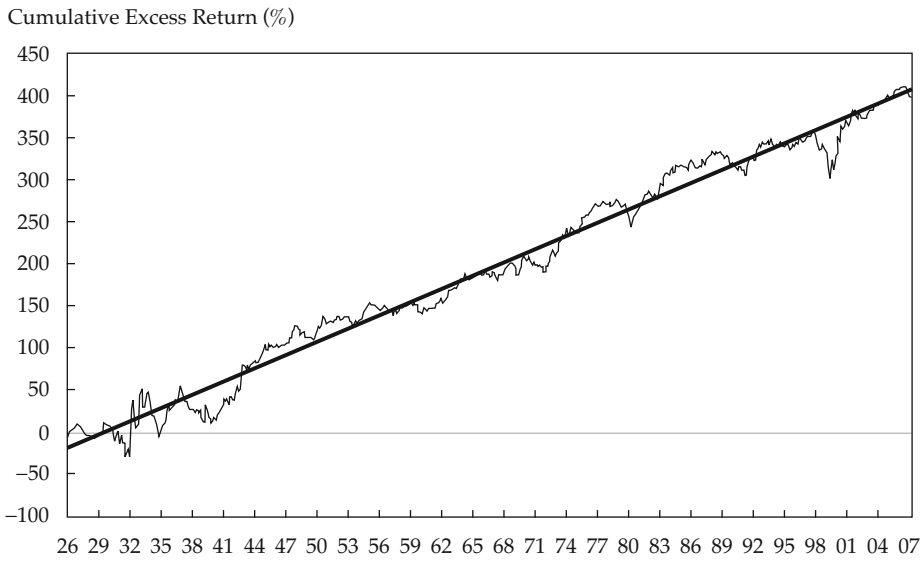
Empirical Evidence

Having established the nature of value and momentum strategies and their applicability on a historical scale, I will present empirical data for a somewhat shorter period (1990–2007) and show how value and momentum compare for a wide range of uses, comparing them separately and with a 50/50 combination of the two strategies. Volatility levels for the value and momentum portfolio are adjusted to a 10 percent annualized volatility based on either an AQR Capital Management or MSCI Barra risk model. Value for all stocks is based on the price-to-book ratio. Momentum is based on one-year price momentum. The value line (see **Figure 2**) is the cumulative excess return on long low-price-to-book stocks and short high-price-to-book stocks. The momentum portfolio line is long strong momentum and short weak momentum.

From these two individual portfolios, we create a 50/50 combined portfolio that is adjusted to equal the volatility of the separate value and momentum strategies. Because the combined portfolio has approximately the same volatility as its components, if it results in a higher Sharpe ratio, it should earn higher returns. All results are gross of transaction and financing costs.

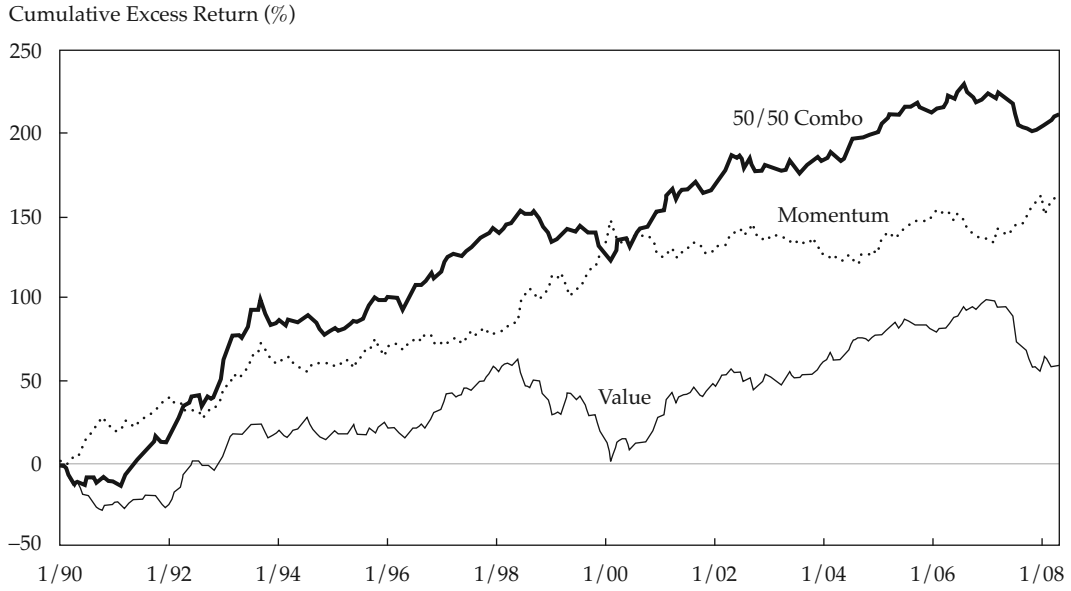
Applying Value and Momentum Strategies. The cumulative excess returns of the individual portfolios shown in Figure 2 are not meant to imply that momentum is a better strategy than value. First, the results are gross of transaction costs, and momentum certainly trades more often than value. Second, depending on the particular period chosen and the definitions of what constitutes value and momentum, the results can be reversed. And third, I believe that across the industry we can make value better through research more reliably than we can make momentum better through research.

Figure 1. Cumulative Excess Return to Value: 1926–2007



Source: HML returns derived from the website of Ken French: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Figure 2. Value and Momentum for U.S. Stock Selection: 1990–April 2008



Notes: Value is price to book, and momentum is returns for the last year (excluding the last month). Sharpe ratio, value = 0.24; Sharpe ratio, momentum = 0.70; correlation (value with momentum) = –0.53; Sharpe ratio equal weighted combined = 0.90.

Certainly, both strategies work in the sense that both have positive Sharpe ratios. In addition, they are negatively correlated, with a correlation coefficient of –0.53. With half of the portfolio in value and the other half in momentum, it is a quant strategy that is almost as simple as value or momentum alone. Two years ago, the results were almost overwhelmingly good, as can be seen in the value peak from 2006. But during two significant periods, value did very badly while momentum did quite well. The first was the tech bubble of 1999–2000; the second was the past year or two, when value has underperformed while momentum has proven to be quite strong. In fact, value spreads are now about halfway to the level they were during the tech bubble.

Applying Value and Momentum Globally. My discussion to this point has been based largely on the U.S. stock market, but opportunities may exist elsewhere in the world. To take advantage of these opportunities, however, U.S.-based firms must learn to overcome three challenges:

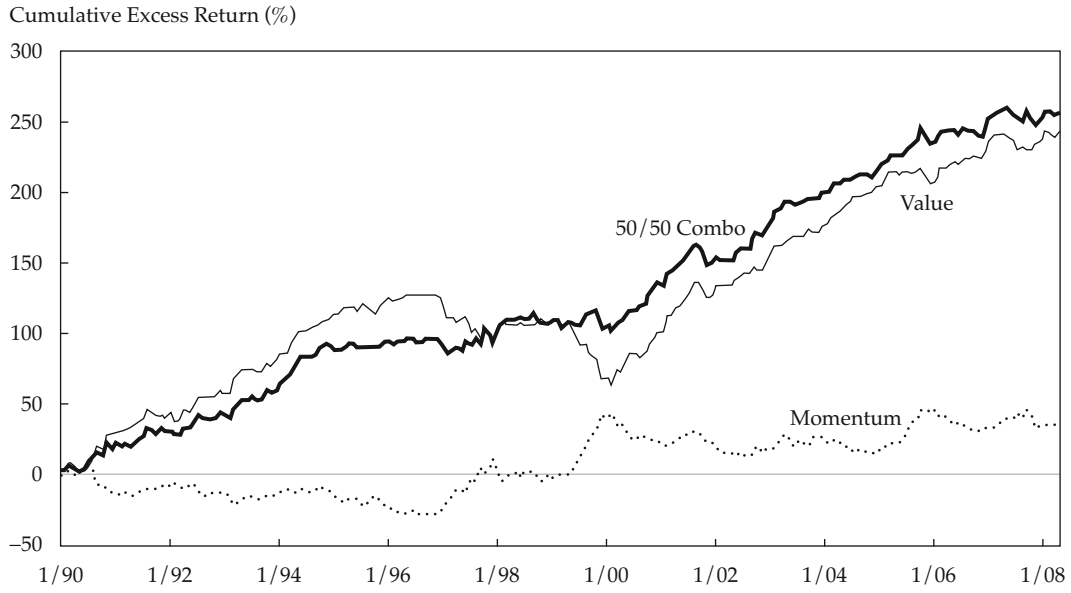
- Different countries have different accounting systems.
- Biases (e.g., underreaction to new information), where they exist, are likely to be different in different cultures.
- Data mining, so successful in the United States, may not work as well elsewhere. It is possible that the results in the United States are merely random.

One of the ongoing puzzles in finance is why momentum does not work in Japan, as shown in **Figure 3**. With a Sharpe ratio slightly over 1, value is clearly a considerably better strategy in Japan than in other places. At the same time, momentum is highly negatively (–0.56) correlated with value and still enjoys modest success, evidenced by its Sharpe ratio of 0.16. It is hard to be that negatively correlated with a winning strategy without losing. Although I think that this underperformance of momentum is largely random, I must admit that I have been saying this for about eight years, and the situation in Japan has continued.

Europe, by contrast, presents precisely the opposite situation. Momentum has been very strong, and price to book has been a weak strategy. But a combination strategy holds up quite well. If I were to put half of my money in Japan and half in continental Europe, I would get just the right result.

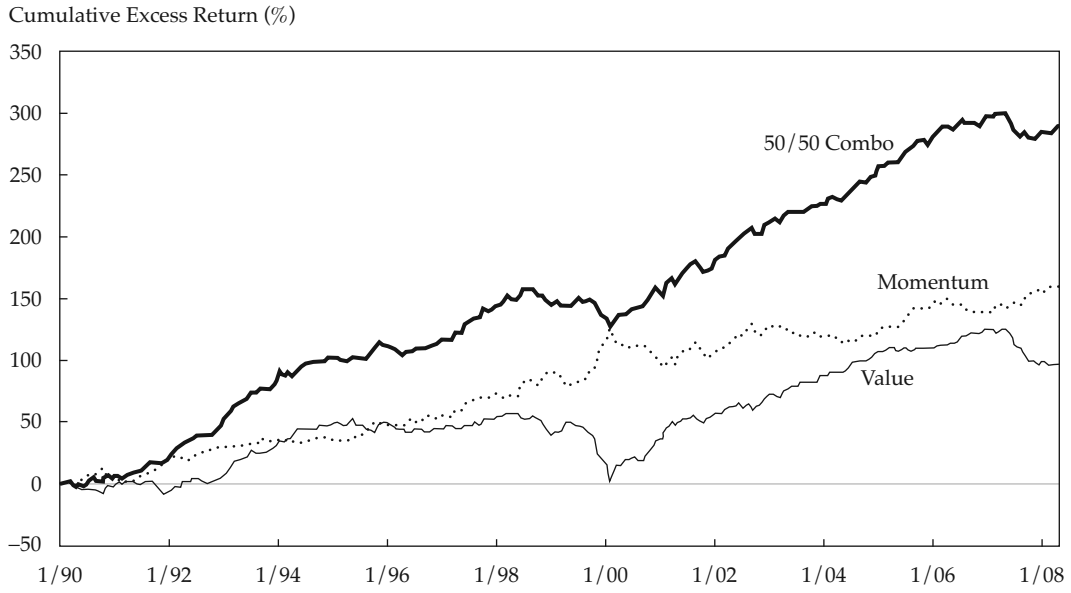
Taking that approach a bit further, if I created a combination strategy in the United States, the United Kingdom, Japan, and continental Europe and aggregated the four, the results would match **Figure 4**. Both value and momentum work over the long term, but the 50/50 combination portfolio works even better. During the two periods of serious deviation between value and momentum—the bubble of 1999–2000 and the current downturn—value lost enough to hurt the 50/50 strategy. Note also that

Figure 3. Value and Momentum for Japanese Stock Selection: 1990–April 2008



Notes: Value is price to book, and momentum is returns for the last year (excluding the last month). Sharpe ratio, value = 1.02; Sharpe ratio, momentum = 0.16; correlation (value with momentum) = –0.56; Sharpe ratio equal weighted combined = 1.21.

Figure 4. Value and Momentum Equal Weighted for U.S., U.K., Japanese, and Continental European Stock Selection: 1990–April 2008



Notes: Value is price to book, and momentum is returns for the last year (excluding the last month). Sharpe ratio, value = 0.54; Sharpe ratio, momentum = 0.88; correlation (value with momentum) = –0.59; Sharpe ratio equal weighted combined = 1.58.

once the bubble of 1999–2000 had passed, those of us who combined value and momentum did extremely well. Therefore, although I realize that a repeat of patterns cannot be guaranteed, I am certainly optimistic about the near future.

Taking Value and Momentum beyond Stock Picking. One of my first assignments after completing my PhD was to try to develop quantitatively based equity market country selection techniques. In thinking about how to accomplish

this, my colleagues and I recognized that we had all done value and momentum studies on the U.S. equity market and thought this would be a good place to start. We recognized the obstacles to making value and momentum work. For example, there would be different accounting standards and currencies. Also, the number of countries that could be included is considerably smaller than the number of equities in the U.S. market. These difficulties, however, might make any inefficiencies across countries larger and harder to arbitrage away. Furthermore, we also thought that if investors have biases that allow value and momentum to work when picking stocks within an individual country, perhaps those same biases might help with other investing decisions, such as making selections within developed market equities and bonds, emerging market equities and bonds, currency, and commodities.

Based on our research, we have found that for equity country selection, the combination portfolio works better than either value or momentum alone. For bonds, instead of the price-to-book ratio, we use real yield (the yield on a 10-year equivalent of a U.S. Treasury government bond minus economists' forecasts of that country's inflation). The value portfolio is long the high-real-yield countries and short the low-real-yield countries. Momentum is measured based on the change in interest rates. The strategy would simply be to buy the countries where interest rates have fallen the most (or risen the least) and sell the reverse. Once again, all three strategies work over the long term, but the combination portfolio works better than either strategy alone. As it happens, the past two years have been particularly hard on the value strategy.

For the most part, emerging equity shows the same results as developed equity, but interestingly, in emerging equity, value has been making something of a comeback lately, which we have not seen in developed markets in the past few months. This trend is the result of corrections in China and India, markets that value strategies would not favor.

Currency can be evaluated in a value context in numerous ways, and like most managers, we use several different methods. The simplest is contrarian returns. We buy five-year losers and sell five-year winners. Price momentum is based on buying one-year winners and selling one-year losers. Both strategies do well in the long term, but once again, the combined strategy works best. Being a value investor (i.e., a contrarian) in currencies, however, has not been a pleasant place to be during the past couple of years.

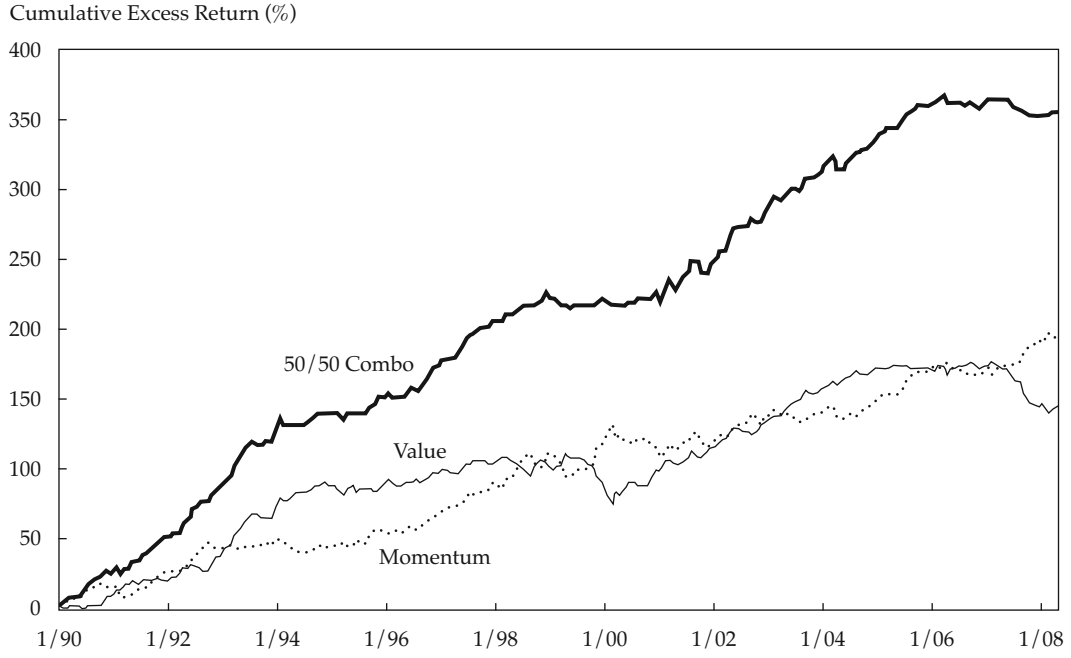
Finally, the most noteworthy failure of contrarian investing for a decade now has occurred in commodities. In contrast, momentum investing has done quite well. In the quant world, we assert that strategies need time to sort themselves out, but a decade is a long time to fail. Nevertheless, I have not given up hope. Fifteen years ago, contrarian commodities investing was doing quite well, but more recently, its only accomplishment is to offset the excellent returns of momentum investing, thereby flattening out returns to the combined strategy.

Figure 5 shows all the investments presented so far and averages across each stock selection and asset allocation strategy, creating equal risk within every strategy. The result is the ultimate smooth version of everything I have been showing. Value and momentum both work over the long term. But the combined strategy works especially well, even though it has been flat for the past several years. The only other extended flat period for the combined strategy was the bubble of 1999–2000. In fact, if I look across the strategies I have presented, the deviation between value and momentum is behaving in a similar manner to the tech bubble. Today, most value strategies have been unsuccessful, but not to the same degree as during the tech bubble.

Disclosures about Quant Strategies

Before concluding, I must note that these strategies involve the use of leverage. As I mentioned before, I am trying to maintain 10 percent *ex ante* volatility in all the long–short portfolios. To do that, I must lever up a bond strategy and delever a commodity strategy. For example, at $1 long versus $1 short, the volatility of the emerging market long–short value portfolio is 29 percent a year and that of the long–short value fixed-income country portfolio is 3 percent. Combining these strategies as is essentially means that an investor is undiversified. Creating equal *ex ante* 10 percent volatility portfolios involves leveraging low-volatility portfolios, such as fixed income, and deleveraging high-volatility portfolios, such as emerging markets and commodities. Combining these into one portfolio leads to a portfolio with a high risk-adjusted return because the combined portfolio will have low volatility as a result of the effects of diversification. To achieve the desired degree of volatility in the combined portfolio, I will have to use leverage. The methodology follows basic financial theory—find the best risk-adjusted portfolio and lever it if its risk is too low. Investors who want to or have to avoid leverage need to be informed.

Figure 5. Value and Momentum for All Investments: 1990–April 2008



Notes: Average across each stock selection and asset allocation selection. Sharpe ratio, value = 0.78; Sharpe ratio, momentum = 1.05; correlation (value with momentum) = –0.55; Sharpe ratio equal weighted combined = 1.94.

A few other factors may make the results I have presented appear more optimistic than I intend them to be. First, I have included no transaction or financing costs, which, of course, will reduce returns. Second, returns may be lowered precisely because of products such as these, although I believe that in the short run at least, this will not occur. Third, back tests never have problems related to leverage, such as inconvenient yield curve changes, credit spread widening, or difficulties obtaining financing in the first place. Also, back tests never suffer a crisis of confidence in the strategies tested. They never lose their nerve and take off their positions at exactly the wrong time.

In some aspects of this presentation, however, I have perhaps understated the degree to which these strategies can be successful. For example, these quant strategies can work over time in other situations. Furthermore, I have not only presented the simplest value and momentum measures but also naively weighted the strategies the same. Many improvements in these methods are possible, such as improved measures for value and momentum, variable strategy weighting, and dynamically varying value versus momentum strategies. Presently, quant equity spreads look very wide and there are not a large number of researchers pursuing these opportunities.

Conclusion

Based on the data, models, and insights I have just presented, the bulleted items below summarize my conclusions.

- Value and momentum work for a variety of investment decisions; although the effectiveness of the two strategies varies, systematic failures of the combination are not found.
- Implementing these strategies globally yields a far higher Sharpe ratio than on an individual country basis.
- The behavior of these strategies is observable by using simple measures, and potential improvements abound.
- Sound portfolio construction, which requires diversification not just by dollars but by volatility, generally requires leverage.
- Quant strategies are vulnerable whenever many managers are doing the same thing at the same time and financing shorter than their investing horizons.
- Quantitative equity represents a strategy that has worked for more than 80 years and now looks even more attractive than usual. Its benefits have not been arbitraged away.
- Many managers loved quantitative methods one year ago but are not fans now, perhaps precisely when they should be.

This article qualifies for 0.5 CE credits.

Question and Answer Session

Clifford S. Asness

Question: Are quant models inherently flawed because they fail to account for a changing economic paradigm?

Asness: I don't think so. First, consider the implications of what it means to be a new paradigm. Such things permanently change how the world works. Certainly, they happen, but they happen far less often than people think. I think quant models, particularly value models, play the odds that new paradigms are less common than typically assumed, and the combination of value and momentum models helps keep investors from being sucked in at exactly the wrong time. By ignoring such changes, quant models protect investors from their own worst impulses.

Question: Because book value for financial companies is so dependent on estimates, how do you adjust for it in your analysis?

Asness: We don't really use book value to price for financial companies because we don't trust it. That said, we take most of our value positions within an industry. So, if book to price is suspect, so long as it is suspect in the same way, we could still be getting our relative rankings correct.

Question: Are quant strategies inherently contrarian, or are they lacking an appropriate dose of contrarianism?

Asness: Buying what other people do not like, which is the value side of the combined strategy, is certainly contrarian. But when a number of people pursue the same contrarian strategy, can it still be considered contrarian? When prices have a larger differential than normal, I think it can. Still, within the quant space, perhaps we could use some more contrarianism to differentiate quant strategies from each other. But when measured against the rest of the investment world, quants are still highly contrarian.

Question: If results can be flat for long periods, how long can a real-world manager afford to follow such strategies and not lose clients?

Asness: You are right in assuming that three to five years, for instance, is a long time to expect clients to stick with a strategy that is not making money. That is one of the reasons I believe in these strategies more in combination than individually. Furthermore, each strategy has more going for it than I have been able to present here. At the individual strategy level, none of these strategies has a high enough Sharpe ratio to build a business on. Even when strategies are used in combination, flat periods still occur, but that is how the real world works. Nevertheless, in combination, these strategies offer a high enough risk-adjusted return for building a nice, stable business. That is why quant managers strive for breadth.

Question: If all managers became quants, would the market become inefficient?

Asness: Let me start by saying that managers who assert they have alpha are simply being arrogant because after costs and fees, the average is negative. When I give advice, I usually start by recommending a fair amount in indexing. That does not mean that I don't believe in what we do, but I cannot ignore the reality of the math, which indicates that anyone who invests in enough active management will end up with the index minus fees. I can also argue, however, that it would be terrible if everyone was indexing, because prices would be undefined. But anyone who is indexing gets a free ride off the people who are doing active management. So, despite the criticism they receive, active managers certainly serve a purpose by uncovering prices.

Question: Can you describe the evolution of your thinking about why value and momentum work?

Asness: I started off believing in efficient markets. Consequently, I believed that behavioralists—people who believe that markets are not perfectly efficient—were as wrong as it was possible to be. Through time, however, I have become a mix of the two—part behavioralist and part a believer in efficient markets. But when I go to behavioral finance conferences, I feel that ideas are being presented as one side versus the other side. But the world does not require an answer that makes one side entirely right and the other entirely wrong because in the real world, answers are more complicated than that.

Certainly, living through the bubble of 1999–2000 convinced me of some inefficiency in the market. The only efficient market explanation for that time would have been that internet stocks were priced at such a high level because they were less risky than other stocks. I am now convinced that a significant part of the bubble of 1999–2000 was caused by inefficient markets. So, I believe in a mix, and mixes are quite complex and are not necessarily stable

through time. Sometimes, the market can be rife with inefficiency, and at other times, it can be relatively stable. When that occurs, investors will get most of their return from a true risk premium.

With a long time horizon, a risk premium is the better source of return. Although not a free lunch, it does not go away, because it is a real risk premium. If I bet on inefficiency, I may do quite well and may even be overcompensated for a while, but inefficiency can disappear. Fortunately, it does not matter which I prefer. The world is as the world is.

As for momentum, even though Fischer Black got much more right than he did wrong, he believed that data mining was the explanation for momentum. But the out-of-sample evidence simply does not support that conclusion. At the same time, I have never seen a credible risk-based explanation for momentum. So, at this point, I believe momentum is largely an inefficiency in the market.

Yet, one of the glaring failures in my field is that we do not know what causes the inefficiency. A problem for our profession is that the two leading candidates to explain momentum—overreaction and underreaction—are precise opposites. With underreaction, the price moves about half of what it should. Thus, observing the price move and assuming it will continue in that direction tends to work because price takes a while to get there. With overreaction, the price moves exactly the right amount, but then money tends to chase performance, which causes an overshoot. Personally, I lean slightly toward overreaction because that blends more naturally into a value investor's world view.

