

# The evolution of quantitative management





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## Executive summary

Traditional active equity managers tend to fall into one of two camps: quantitative managers who use objective mathematical algorithms to rapidly perform a systematic assessment of fundamentals and valuations for a large number of companies; qualitative (fundamental) managers who take a human approach, seeking to gain an understanding of a company and its prospects through in-depth and sometimes more subjective research. While both seek to outperform a market index, the two approaches differ considerably. At Charles Schwab Investment Management, we believe there is merit in each approach, and we have refined our active equity investment approach in an attempt to capitalize on both.

In this paper, we discuss the evolution, strengths, and weaknesses of quantitative investing; the benefits of overlaying a qualitative perspective; and how our active equity investment approach has evolved to take advantage of the best of both approaches. Advantages of an integrated approach that combines both quantitative and qualitative strategies are:

- Breadth as well as specific analysis
- A consistent, repeatable process
- An emphasis on risk management
- Systematic portfolio construction

## The roots of quantitative management

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Quantitative investment strategies are based on the premise that historical relationships among investment factors persist over time. The strategies are driven by mathematical and statistical models using quantifiable data aimed at identifying common factors in returns, and are thus designed to remove emotional input from the process. Advantages of quantitative strategies include objectivity and reproducibility of the decision-making process, ability to cover a wider investment universe, protection from behavioral errors, and optimization of risk and return.

Financial market historians attribute the beginning of quantitative strategies to Harry Markowitz's seminal work on portfolio theory in 1952.<sup>1</sup> Following William Sharpe's 1963 unveiling of the means to effectively calculate alpha and beta, quantitative analysis began drawing interest—primarily among behavioral finance academics who, during the 1970s and 1980s, published thousands of papers that presented the results of scenarios in which anomalies were proposed and tested. Quantitative equity management grew out of the work of these researchers, bringing together practitioners and academics in search of factors and characteristics that would signal when a stock had the potential to beat the market on a risk-adjusted basis.

As they grew ever more sophisticated, quantitative systems evolved from simple stock screeners to sophisticated “black box” algorithm-based programs that could rapidly sift through billions of data points, follow a complex series of rules, and identify miniscule price anomalies among securities—often without human intervention.

The quantitative strategies generally succeeded. In the early 2000s, having survived the dot-com

bubble essentially unscathed, quantitative strategies gained widespread legitimacy. Strategies employing leverage were particularly successful. A 2005 study by Casey Quirk & Associates found that quantitative-driven processes offered better risk-adjusted performance than fundamental managers.<sup>2</sup> Indeed, the strategies were so successful that fundamental managers began to employ them; because quantitative managers had performed so well, their strategies were believed to be nearly foolproof.

## The setback

Quantitative management exhibited a strong run until 2007. During the first half of that year, events in the subprime mortgage markets in the U.S. set the stage for the coming turmoil. As housing continued to weaken from its peak in 2006, some types of subprime loans began to default. In February 2007, Freddie Mac announced it would no longer buy the most risky subprime loans. In April of that year, the first large subprime lender filed for bankruptcy. In July 2007, Bear Stearns liquidated two of its mortgage-backed security hedge funds. The result was a credit crunch of mammoth proportions, leading quantitative managers—as well as the fundamental managers who had embraced quantitative strategies—to reduce their leverage and seek liquidity.

By that same time, many multi-strategy hedge funds running quantitative equity strategies were investing in highly leveraged credit instruments as well as less liquid mid and small cap equity names. The success of quantitative strategies to this point had led to high correlations among quantitative—and fundamental—managers, who had been using the same screens, chasing the same return factors, and increasingly identifying the same companies. When the values of those leveraged securities began to fall, the funds were forced to raise cash to cover margin calls. But because the rapidly changing market values of those liquid securities were hard to determine, the funds generated cash by selling equities instead. And because so many

of those funds were holding similar positions, their concurrent liquidations triggered steep declines in the prices of those stocks. As a result, many quantitative managers found themselves in the same predicament at the same time. Those declines, in turn, increased the overall volatility of the broader market, ultimately driving other managers—even those not invested in leveraged credit instruments—to reduce their leverage in an effort to manage their risk and avoid margin calls.

One example of a strategy popular at the time was “portable alpha.” Employed primarily in conjunction with market-neutral approaches (often by hedge fund of funds managers), it involved separating the “alpha” (the uncorrelated part of the investment) from the “beta” (the market index). This was accomplished by investing in a portfolio of securities that differed from the market index from which the beta was derived. The strategy utilized the futures market to fund the beta exposure so that the lion’s share of the capital could be invested in the alpha exposure. Most equity index futures require only \$1 of initial margin for every \$20 of the index futures exposure, which equates to leverage of 20:1. However, when that alpha exposure failed to deliver and the market began its descent, funds employing this strategy had no ability to withstand their losses.

Over a mere four days in early August of 2007, as a result of the market events discussed above, a number of high-profile long/short equity hedge funds that employed quantitative strategies experienced unprecedented losses. Known as the “quant quake,” it was a colossal, unusual, and highly technical event that shook quantitative managers to their core. Although beyond quant funds, the quant quake was barely a blip, it had long-lasting impacts. For the remainder of that 2007 and through 2009, many quantitative managers underperformed both traditional managers and market indices by significant margins, uncovering a serious weakness of quantitative approaches. Their algorithms failed to account for unexpected events or dramatic shifts in the economy.

In some ways, one could argue that it was not the quantitative process itself that was to blame for the quant quake and the ensuing downfall of quantitative strategies, but rather a naïve belief that financial alchemy was indeed possible. Nonetheless, it did not take long for quantitative strategies to lose their luster, and in the wake of the global financial crisis, the prevalence of quantitative management declined significantly. Matthew Rothman, then an analyst at Barclays Capital, in 2011 estimated that equity assets managed by quantitative managers in the U.S. alone fell by 55 to 60 percent from their peak in June 2007 to \$483 billion by December 2009, with another \$80 to \$100 billion flowing out of quantitative equity strategies in 2010.<sup>3</sup>

## Lessons learned

What happened during those years made the challenges of quantitative investing abundantly clear, from the standpoint of both its backward-looking use of data to forecast risk and return as well as its forward-looking interpretation of financial results. Within a relatively short timeframe, it became clear that quantitative investing operating alone was not well-suited to market crises, especially those marked with inflection points at which market leadership shifted dramatically. The models driving these strategies were unable to anticipate the rapid switches from “risk-on” to “risk-off”—when correlations among commodities, stocks, currencies, and bonds were high—and from high-quality stocks to distressed ones that characterized 2009.

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### Quantitative investing operating alone was not well-suited to market crises.

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In addition, quantitative strategies were not designed to know everything about every holding in their portfolios, so they often overlooked key qualitative measures that might have identified factors not necessarily clear or obvious and helped put them in perspective. For example, a quantitative screen of undervalued companies run in June 2007 would have placed Lehman Brothers at the top of the list.

The deleveraging that marked 2007 through 2009 most certainly was not confined just to quantitative managers. But it hit them first; they were the proverbial canary in the coal mine. So while quantitative funds were widely regarded as failures during this period, they were not the only ones; they were just the first to exhibit it. However, as of the end of 2009, the enigmatic “black box” had lost its mystique, and fundamental approaches began to gain favor.

### The birth of an integrated approach

The reality is that both strategies have much to offer. Quantitative strategies have been shown to be useful during non-volatile markets; qualitative strategies that use forward-looking valuations have tended to do well during periods of higher volatility. The need to analyze huge amounts of information is a powerful argument in favor of modeling. Although potential risks of qualitative assessments may exist, such as portfolio managers being emotionally tied to a company, qualitative analysis may be valuable during asset bubbles and at inflection points since it can offer more flexibility in reacting to market risks and changing investor sentiment. And the value that humans can offer—such as judgment and nuance—cannot readily be incorporated into mathematical models. Indeed, many of the challenges facing pure quantitative managers—such as correlating markets, fundamental market shifts and insufficient liquidity—can be addressed through an integrated approach.

Although generally positioned as polar opposites, the lines between the two approaches have begun to blur. In practice, all investment approaches incorporate some form of quantitative analysis in the process of identifying and distilling down potential companies from a large investment universe. Traditional fundamental managers have begun to embrace the use of risk models. Quantitative managers, on the other hand, have typically used some degree of fundamental research—whether it is defining inputs or allocating weightings.

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[The reality is that both quantitative and qualitative approaches have much to offer.](#)

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In addition, the quant quake and the subsequent crunch have been highly informative. Investment managers and investors alike are now more aware of the fact that all strategies have risk. Different signals work well at different times and with different market and economic conditions. For that reason, it is useful for managers to have discretion over purely statistical inputs, allowing them to apply knowledge and expertise to take advantage of potential opportunities. In addition, with an integrated approach, the weight or importance given to various factors can be adjusted based on current conditions—for example, when value and growth markedly diverge.

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### Examples of quantitative versus qualitative viewpoints

Quantitative	Qualitative
Attractive relative valuation multiples	Detailed sales and income analysis
High levels of sales, income and cash returned to shareholders relative to the stock’s price	Qualitative assessment of balance sheet
Improving analysts’ earnings forecasts	High quality of management
Strong relative price performance	Long-term company and industry trends
	Assessment of competitive threats

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## Benefits of an integrated approach

Quantitative	Qualitative
<b>Breadth:</b> The ability to cover a large universe of stocks	<b>Specific company analysis:</b> The ability to analyze a company's financial statements, news, and corporate actions
<b>Timeliness:</b> Analysis can be performed quickly	<b>Forward-looking:</b> Adaptive and anticipatory of changes in the marketplace
<b>Unbiased:</b> Portfolio managers are not emotionally tied to stocks	<b>Inflection points:</b> Better able to deal with market upturns and downturns

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A keen eye toward portfolio construction and how securities work together

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## The philosophy behind our active equity strategies

Different signals work well at different times and with different market conditions. For that reason, it is useful for managers to have discretion over purely statistical inputs.

We believe that inefficiencies exist in the equity markets and that a disciplined investment process can exploit those inefficiencies. As such, we view active equity analysis as a dynamic process that demands both quantitative and qualitative analysis. Models have inflection points and blind spots; by overlaying a quantitative model with macroeconomic data and qualitative insights, we strive to ensure that we are not missing anything. In taking such an approach, we affirm the value of quantitative analysis's solid, theoretical foundation of behavioral science, but recognize that the dynamic nature of the market makes human intervention useful. And with cycles growing shorter and vast amounts of data more readily available, combining more forward-looking fundamentals with the strengths of quantitative analysis—taking the best of both approaches—could best serve investors over a long time.

Our investment ideas for our active equity portfolios come from a combination of proprietary, academic and sell-side research. By applying an integrated

approach, we can complement quantitative signals with an understanding of unique circumstances and the knowledge that economic and market conditions continually shift and interact in subtle ways. At the same time, we can process hundreds of companies in a short time period and in a highly systematic fashion free of biases. This integrated approach, we believe, provides a higher confidence level in our understanding of a cycle and where we are in that cycle.

We also understand that the backtesting inherent in quantitative analysis may be limiting at times because the unique environments that can skew the analysis are often few and far between. By layering on a few less-correlated risk factors, we believe that we can create a more efficient portfolio that has the potential to perform over multiple market cycles with better risk-adjusted returns. Our goal for our portfolios is to be rewarded for taking intentional risks and to avoid unintentional ones.

But the real benefit of our integrated approach is that we are continuously monitoring and evaluating what concepts are working and feeding those learnings back into our investment process in an effort to continuously improve our evaluation process and optimize our portfolios. We learn from the past and apply those lessons to evolve our investment thinking.

With markets dynamically changing, assumptions need to be tested—not just once, but continuously.

But the real benefit to investors of our integrated approach is that we are continuously monitoring and evaluating what is working and feeding those learnings back into our investment process.

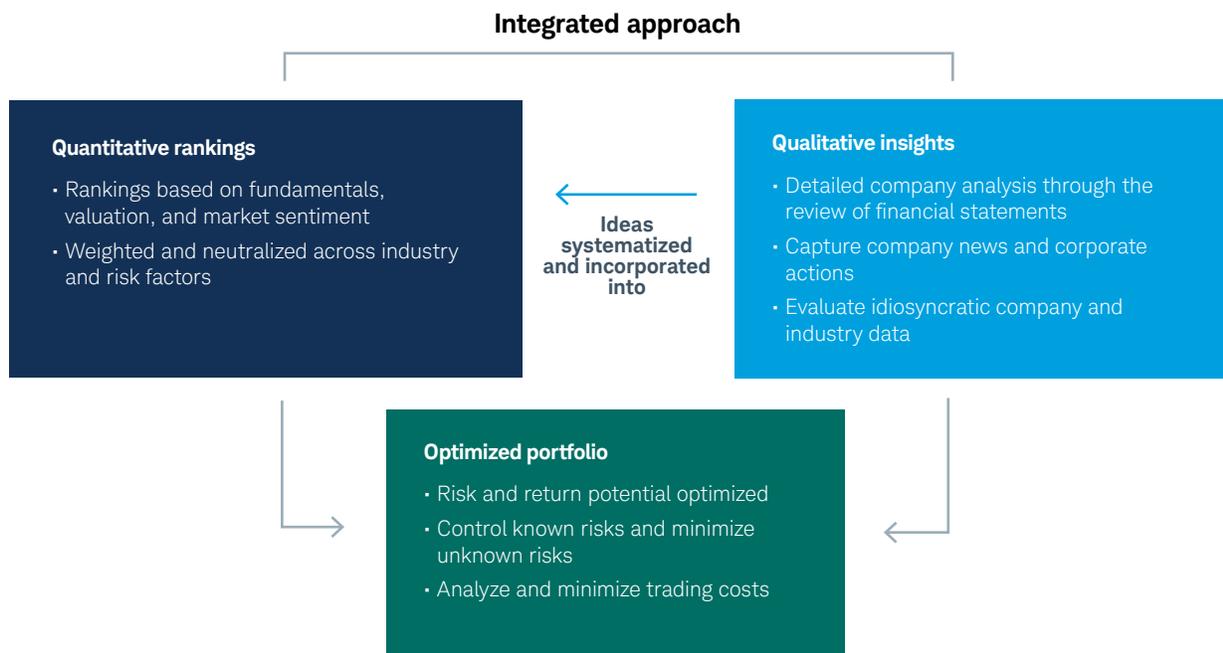
Every day, we look at our portfolios with fresh eyes. That means we are open to reconsidering previously rejected companies in light of new findings or changing market conditions, and we critically evaluate current holdings to make sure that what initially attracted us still resonates. We also conduct extensive and detailed post-trade analysis, from which findings are applied to modify or adapt portfolio construction and future trading, along with thorough and regular attribution analyses. In so doing, our objective is to evaluate our portfolio management and research team’s investment theses and assess drivers of performance. The knowledge gained from incorporating our findings back into the investment process, combined with our flexibility, allows us to shift weights among signals, styles or other attributes, as well as to add,

delete, and reformulate signals when we determine that such signals will enhance performance potential.

Our portfolio management and research team applies its expertise and informed insights to forecast business results that differ from embedded consensus. We perform research that takes into account different types of anomalies. We search unrelentingly for gaps in our theses. We constantly evaluate where we are on the risk spectrum. These are things that cannot readily be input into a computer. Further, while we are not big believers in making dramatic changes, incremental change is imperative to what we do.

We are highly mindful of risk, managing it at every step of the investment process. It starts with performing stock-selection research on a risk-adjusted basis. We then build risk-adjusted portfolios in which we care greatly about individual positions, industry and sector exposures. We also consider style exposures, such as beta and volatility. But we do not view risk as solely about minimizing or mitigating it; we intentionally seek to allow it, because it can create opportunities when used judiciously.

### The philosophy behind our active equity strategies



## Conclusion

In summary, we see the following advantages of an integrated approach that combines both quantitative and qualitative strategies:

- Breadth as well as specific analysis
- A consistent, repeatable process
- An emphasis on risk management
- Systematic portfolio construction

The market and its inputs are dynamic and ever-changing. There will always be headwinds

and tailwinds. Value (or growth) will fall out of favor; an inflection point will develop; regulators will change reporting rules. In certain environments, some strategies will not work. Although it is often valuable, history cannot always be relied upon to provide guidance. Every day presents a new set of opportunities and challenges. We believe that by applying a thoughtfully derived balance of quantitative rankings and qualitative insights, we will be better equipped to take advantage of those opportunities when they arise.

### Charles Schwab Investment Management

With a straightforward lineup of core products and solutions for building the foundation of a portfolio, Charles Schwab Investment Management advocates for investors of all sizes with a steadfast focus on lowering costs and reducing unnecessary complexity.

#### Past performance cannot guarantee future results.

1. Harry Markowitz, "Portfolio Selection," *The Journal of Finance*, March 1952.
2. Casey Quirk & Associates, Research Insights, "The Geeks Shall Inherit the Earth?—Quantitative Managers' Recent Edge," November 2005.
3. Michael Shari, "Quant Shops Innovate to Survive," *Financial Times*, March 6, 2011.

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There can be no assurances that the techniques and methodology described in this white paper can guarantee against market losses nor does it promise outsized market gains.

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