JACOBS LEVY
EQUITY MANAGEMENT℠

JACOBS LEVY CONCEPTS FOR PROFITABLE EQUITY INVESTING

Our investment philosophy is built upon over 35 years of groundbreaking equity research. Many of the concepts derived from that research have now become widely accepted in the academic and practitioner investment communities. The ten concepts summarized below form the foundation of Jacobs Levy's approach to profitable equity investing.

1. The U.S. stock market is a *complex system.*

Contrary to the assertions of the efficient market theorists and random walk advocates, we find that price behavior in the U.S. stock market is not entirely efficient or random. Active investing can exploit inefficiencies and generate excess returns. However, simple rules—buy low-P/E stocks, buy "value," buy small-cap—cannot provide superior returns on a consistent basis.

In a 1989 *Journal of Portfolio Management* article selected for *Streetwise: The Best of the Journal of Portfolio Management* (1997), we introduced the concept of the market as a complex system, in which prices are driven by numerous interacting factors. These include company fundamentals, such as earnings and growth rates; macroeconomic conditions, such as interest rates and inflation; behavioral factors, such as investors' tendency to overreact and to herd; and institutional factors, such as regulations. As a result, the market is permeated by a *complex web of return regularities.*

Regularity in stock price movements implies predictability, which may be exploited to produce superior investment performance. Given the complexity of the market, detection of such investment opportunities is beyond the scope of the human mind alone. It requires statistical modeling of a large number of theoretically plausible and intuitively sensible return-predictor relationships over a broad and diverse range of stocks.

2. The market's complexity requires a *rich*, *multidimensional model.*

We model a large number of potentially valuable return-predictor relationships across the broadest possible equity universe. This *unified approach*, which we introduced in a *Journal of Investing* article in 1995, has several benefits over a narrower, more segmented approach. It takes advantage of all the information provided by a diverse range of securities. The effect of interest rate changes on growth stocks, for instance, may have implications for the behavior of value stocks, information that a focus on value stocks alone would not reveal. A unified approach is thus able to provide more robust insights.

The modeling process also considers variations in the relationships between returns and potential return predictors over different types of stocks and different market environments; earnings revisions, for example, may have a greater impact on growth than on value stocks. It also allows for nonlinearities in effects; increasing magnitudes of earnings surprises, for instance, may have a diminishing marginal impact on stock price.

Breadth of inquiry combined with depth of analysis increases the number of potentially profitable investment opportunities we can detect and the accuracy of the predicted returns from those opportunities. This allows us to build portfolios that are diversified across many small exposures to numerous opportunities, increasing the potential for superior investment performance.

3. A unified approach preserves the *law of one alpha*.

Our unified approach affords us a coherent framework for security analysis, preserving "the law of one alpha" that we introduced in a 1995 *Journal of Portfolio Management* article. Specifically, any investment firm that generates return predictions should come up with one, and only one, alpha estimate for each stock. This allows each stock to be consistently valued relative to every other stock in the investment universe. A firm that uses different models for the same stock in different strategies would produce multiple alpha estimates. Yet there can be only one true mispricing for each stock.

Consider a firm that offers a value strategy and a momentum strategy. The value strategy may recommend buying a stock that drops in price because it is a better value, while the momentum strategy may suggest selling that same stock because of its negative momentum. The firm is essentially assuming that the expected excess return from this single stock is both positive and negative.

4. Return-predictor relationships must be *disentangled*.

Robust insights into stock price behavior emerge only from an analysis that carefully considers numerous factors simultaneously. In defining "value," for example, a model that grapples with the market's complexity does not confine itself to a dividend discount model (DDM) estimate of value, but also examines earnings, cash flow, sales, and dividend yield, among other variables. These variables may be closely correlated with each other, as well as with industry effects. For example, a simple low-P/E screen would select a large number of bank and utility stocks.

Naïve attempts to relate returns and potentially relevant predictors do not take correlation into account. Quintiling or univariate analysis, for instance, naïvely assumes that prices are responding only to the variable under consideration. By contrast, simultaneous analysis of all relevant variables takes into account and adjusts for any correlations; the results of such analysis provide a truer picture of real return-predictor relationships.

We developed the concept of *disentangling* in the 1980s, and described it in a Graham & Dodd Award winning article in the *Financial Analysts Journal* in 1988. Disentangling forms a cornerstone of our approach. Analyzing return-predictor relationships simultaneously, in a multivariate framework, allows us to extract "pure" returns—that is, the expected return to each predictor, uncontaminated by the possible influences of other factors.

5. *Pure* returns are superior to naïve returns.

As we demonstrated in a series of *Financial Analysts Journal* articles in 1988 and 1989, pure returns, unlike naïve returns, distinguish real effects from mere proxies. Based on naïve analyses of returns to market capitalization, for example, investors long thought that small-cap stocks delivered abnormal returns in the month of January. A sophisticated, multivariate analysis shows that these returns really reflect the tax-related trading habits of investors, not firm size.

By controlling for cross-correlations, multivariate analysis produces pure returns, which we have found to be less volatile, and more predictable, than naïve returns.

6. An *integrated investment process* helps to preserve the value of investment insights.

No matter how potentially valuable the insights derived from research and security selection, they are only as good as the processes used to implement them. Poor portfolio construction and careless trading can erode or even obliterate the return potential of good insights.

A portfolio optimization process that is customized to include exactly the same dimensions found relevant by the stock selection process helps to ensure that the opportunities detected by the modeling process are exploited, while the risks detected are accounted for and controlled. A trade-monitoring system feeds transaction cost estimates back to the portfolio optimizer in order to protect value-added from being eroded by trading costs. And a performance attribution system customized along the same dimensions as security selection and portfolio optimization offers the transparency needed to ensure that all systems are working as expected. We introduced these ideas in a *Journal of Investing* article in 1995.

7. The investment process should be dynamic and opportunistic.

The investment process should be dynamic and opportunistic in several respects. For any given level of investor risk tolerance, for instance, a portfolio's optimal level of active risk should be allowed to vary depending upon the level of mispricing in the market and the manager's skill at detecting and exploiting mispricing. Too strict an emphasis on risk control—for example, targeting a fixed level of residual risk at all times—can needlessly reduce potential return, as we demonstrated in a 1996 *Journal of Portfolio Management* article. Allowing portfolio residual risk to vary opportunistically within an acceptable range can enhance portfolio performance.

Furthermore, pure returns to various return predictors change over time depending on market and economic conditions, creating opportunities for a dynamic process. For instance, small-

cap stocks predictably outperform large-cap stocks in some economic environments and underperform in others. In our 1989 *Financial Analysts Journal* article, we showed that pure returns to small cap are sensitive to unexpected changes in the spread between corporate and Treasury bonds. Dynamic adjustments can improve performance results.

Constant research into existing and potential return predictors is necessary to stay one step ahead of the crowd and keep insights pertinent and profitable. We have found that a dynamic investment system, constantly refreshed with proprietary research insights, provides the best opportunity for outperformance over the long run.

8. **For market-neutral long-short and enhanced active 130-30 portfolios, integrated optimization can create added flexibility in enhancing return and controlling risk.**

Short selling allows the manager to exploit underperformers as well as outperformers. When Jacobs Levy added market-neutral long-short to our repertoire of strategies in 1990, we recognized that the full benefits of this strategy emerge only from an *integrated* optimization. As we showed in a number of articles that have appeared in the *Financial Analysts Journal* and the *Journal of Portfolio Management* since the mid-1990s, the construction of optimal long-short portfolios considers potential long and short positions simultaneously. While a separately optimized long portfolio can be combined with a separately optimized short portfolio, each portfolio remains benchmark-constrained and offers none of the real benefits of market neutral long-short construction.

In a 1998 *Financial Analysts Journal* article, we extended this concept beyond market neutral portfolios to include long-short portfolios that maintain a full market exposure. Long-short portfolios with any given exposure to the underlying market benchmark should be constructed with an integrated optimization that considers simultaneously both long and short positions and the benchmark asset. Rather than combining a long-only portfolio with a market neutral portfolio, it is better to blend active long and short positions so as to obtain a desired benchmark exposure.

That 1998 article laid the foundation for Enhanced Active Equity 130-30 Strategies, deriving precise formulas for optimally equitizing an active long-short portfolio when exposure to a benchmark is desired. Our Enhanced Active Equity Strategies employ integrated optimization and short selling to take fuller advantage of our investment insights. In a 2006 *Journal of Portfolio Management* article, we highlighted the advantages of Enhanced Active Equity portfolios over long-only and other long-short approaches. Our 2007 *Financial Analysts Journal* article debunking several myths about Enhanced Active Equity strategies won a Graham & Dodd Award and the Graham & Dodd Readers' Choice Award. The benefits of integrated optimization accrue to any long-short portfolio, including market neutral and enhanced active.

9. Portfolio optimization should take into account the investor's aversion to leverage, because leverage introduces a unique set of risks distinct from volatility risk.

Conventional optimization will result in the optimal portfolio only if the investor does not use leverage (a "long-only" portfolio) or if the investor uses leverage and has an infinite tolerance for it (that is, the investor has no aversion to leverage risk). This is because conventional mean-variance optimization considers only the tradeoff between expected portfolio return and risk as measured by portfolio volatility. It thus ignores risks unique to using leverage. These include the risks and costs of margin calls, which can force borrowers to liquidate securities at adverse prices due to illiquidity; losses exceeding the capital invested; and the possibility of bankruptcy.

In a 2012 *Financial Analysts Journal* article, we augmented the mean-variance utility function of conventional portfolio theory with a term for investor leverage aversion to account for the unique risks of leverage. This transforms conventional optimization into a mean-variance-leverage utility function that considers the various tradeoffs between expected portfolio return, portfolio variance, and leverage risk. We developed the concept of mean-variance-leverage optimization and demonstrated how this can be applied to long-short equity portfolios to achieve leverage levels consistent with investor tolerances for volatility risk and leverage risk.

In several articles in the *Journal of Portfolio Management* in 2013 and 2014, we refined the mean-variance-leverage model and showed how it can be used to define optimal portfolios that lie along efficient frontiers and within an efficient region. We also examined an alternative method for determining optimal portfolios for leverage-averse investors—traditional mean-variance optimization with leverage constraints—and showed that it provides an investor little guidance about where to set a leverage constraint and cannot identify the leveraged portfolio offering the highest utility. Mean-variance-leverage optimization, by contrast, can identify the portfolio that provides the greatest utility at any given level of leverage aversion.

Traditional mean-variance optimization can result in very high levels of portfolio leverage, because increasing leverage increases expected portfolio return, while the unique risks of leverage are ignored. But such portfolios will not be optimal for most investors, because most investors are leverage averse. Mean-variance-leverage optimization recognizes that leverage has unique risks and thus results in portfolios with lower levels of leverage, such as 130-30 portfolios. Given the role of excessive leverage in several financial crises, less-leveraged portfolios can be beneficial not only for leverage-averse investors, but also for the global economy and markets.

10. Investment insights can be realized as profits only if portfolio holdings are *sufficiently liquid* and *efficiently traded*.

Asset *managers* can succeed for their clients. Asset *gatherers* only handicap themselves and their clients' returns by amassing ever-larger position sizes, which become increasingly costly to trade. We maintain strict capacity limits in order to remain liquid and nimble.

We are also a leader in implementing sophisticated electronic trade execution and monitoring systems. As we discussed in *Investment Management Technology* in 1992, these systems are designed to minimize trading costs and maximize our ability to exploit our proprietary investment insights.

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