SILVER CREEK
CAPITAL MANAGEMENT

QUANTITATIVE STRATEGIES

QUANTITATIVE SOLUTIONS

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Introduction

The nature of investing is changing as the investment process more heavily adopts technology and quantitative methods. The approach used by quantitatively driven investors generally fits into one of five strategies: Quantamental, Risk Premia, CTA, Systematic Macro, and Quant Equity Market Neutral.

To varying degrees, these strategies rely on technology and a quantitative approach to the investment process. Each strategy is broad and defined by the core quantitative methods, investment framework, and asset classes that encompass it. Within each strategy there are numerous different sub-strategies.

In the following series of articles, we describe the strategies used in quantitatively driven investing. In addition, we highlight how they differ from and improve upon the more traditional strategies from which they have evolved.

QUANTAMENTAL

Quantamental is an investment strategy that intermingles together fundamental analysis and quantitative analysis. It relies predominately on the fundamental aspect but uses quantitative tools as an input to the decision-making process.

Typically, the quantitative contribution to the investment process is based on data collection. Investment managers can deploy algorithms to sift through large quantities of data or to gather obscure raw data so as to uncover novel insights into the investment potential of a company. The investment decision making process still focuses on the bottom-up approach to stock selection, but the investment manager uses insights from the data to make better informed investment decisions. That is, the investment manager finds data that can supplement the existing readily available information to determine whether a company's stock is mispriced.

The type and source of data that can be harvested are nearly limitless. As such, an investment manager can distinguish its investment decision making through the use of novel data that provides nuggets of knowledge that are potentially unknown to the rest of the investment community.

Recently, quantamental investing strategies have become popular at the macro level. Instead of seeking out new information on specific firms, quantamental macro looks to glean information through technology on more macro level conditions.

Even though quantamental investing can be highly technical and computationally intensive, investment managers who follow this strategy need not exhibit many of the standard characteristics associated with a quantitative hedge fund. Many quantamental investment managers do not maintain a long/short market neutral portfolio. Many rely on fundamental analysis instead of technical signals, and most have a human, not a machine, make final investment decisions.

Some analysts who cover hedge funds and categorize their strategies have included the use of "screens" as quantamental, (e.g. lists of stocks with high market to book ratios and low momentum exposure). We view such screens as standard practice now and do not believe they constitute a quantamental approach to investing.

Below are three examples of the type of data used in a quantamental strategy and its role in the investment process.

1. ***Have an algorithm go to Home Depot's website multiple times a day.*** For each store, search each SKU number and download the number of inventory in stock. Aggregate the data across all stores and look at changes over time. Use the information to get an estimate of how much revenue Home Depot has generated in the quarter before it reports its quarterly earnings. In addition, the algorithm could identify trends in products over time and use this information to screen new companies in which to potentially invest.

2. ***Buy satellite pictures of the parking lots surrounding all Walmart stores.*** Execute an algorithm that determines how many cars are in the parking lot at different times, and use the estimated traffic to help predict Walmart's upcoming earnings report.

3. ***Run a script that sorts through all tweets and identifies the ones that mention a new movie.*** Have a natural language processing algorithm read the tweets and determine whether their views of the movie are negative or positive. Use the movie's sentiment score to forecast the movie producer's likely sales and whether the producer will exceed or miss its earnings forecast.

4. ***(Quantamental macro) Have an algorithm monitor data on the international movement of container ships.*** Use the movements to help predict import and export flows between countries. Based on the relative import and export data place relative currency investments.

While most investors would value having this sort of information, investment managers that emphasize quantamental investing will put in the time and resources to generate the data.

RISK PREMIA

Standard financial theory dictates that expected returns should be based on exposure to systematic risk. This risk-reward relationship is the foundation of asset pricing. It is neatly summarized in the Capital Asset Pricing Model (CAPM), which derives the relationship in a simple linear framework:

$$E(R_i) = R_F + \beta_i[E(R_M - R_F)]$$

The expected return, $E[R_i]$, for asset or portfolio i is composed of the risk-free rate of return, R_F, that all investors should receive for delaying consumption, as well as the return from being exposed to uncertainty, i.e. risk. The risk premium in the CAPM is fully

captured by asset i's exposure to the market, which is captured in β_i. Beta measures asset i's market exposure, how much asset i moves when the overall market goes up by 1%. $E[R_M - R_F]$ is the premium earned per unit of market exposure.

The CAPM describes the traditional risk premia approach. Based on the above, to boost returns an investment manager need simply to take on more systematic risk. However, such traditional risk premia neither improves risk adjusted returns nor provides returns that are uncorrelated with other assets. The innovation from the industry and academic communities over the last 40 years has shown that overall market exposure is not the only factor that generates a risk premium. Exposure to additional alternative factors can also generate positive expected returns. The return generated from explicit exposure to these alternative factors is what is referred to as alternative risk premia.

What are these alternative factors? There are hundreds that have been documented. It is beyond the scope of this article to detail each one. They range from factors that have become almost as standard as the market (including size, value, liquidity, and momentum), to more recent and less-prominent ones (such as carry, quality, idiosyncratic volatility, and event).

While it is easy for individual investors to gain exposure to the market factor, it is more challenging to isolate a size or value factor. In recent years, the solution has been packaged as the concept known as smart beta. Smart beta is a way for investors to easily access relatively standard alternative risk factors and capture their risk premium. Smart beta ETFs are a low-cost way to gain exposure to standard alternative risk factors.

Hedge funds can still add value in the alternative risk premia space in three ways. First, they have the expertise and resources to form well-diversified long/short portfolios that can isolate and capture specific risk premia. For instance, a hedge fund could obtain a beta exposure on quality, while ensuring a beta on size, momentum, and the market of zero. In this way, hedge funds can precisely capture the desired exposure to risks. Second, they can access less traditional markets for these exposures, such as fixed income, currencies, and derivatives. Third, they can engage in factor exposure timing. The different factors have varying levels of returns over time. If an investment manager can predict when exposure will be profitable versus when exposure will result in a drawdown, the manager can turn exposure on and off and generate high risk-adjusted returns. Similarly, if the investment manager can tactically over/under-weight various implementations of specific premia based upon their relative attractiveness, the manager may also be able to generate high risk-adjusted returns.

CTA

Commodity Trading Advisors, CTAs, are not unique to the quantitative investing world. Nor are they exactly an investment strategy. Formally, a CTA is a regulatory classification that describes an investment manager who invests in a specific set of assets. CTAs typically trade exchange listed futures and they generally are not active in over the counter products, so they have liquid portfolios that are not subject to counterparty risk. However, the CTA term is often used more broadly to capture strategies investment managers use in certain asset classes. The broader use of the term encompasses many types of strategies ranging from discretionary to systematic, and many types of assets, not just commodities, but also currencies, stocks, and bonds. When we refer to the CTA as an investment strategy, we are referring to the subset of commodity trading advisors that utilize quantitative tools.

Much of CTA investing is trend following. Simply put, the investment manager buys when markets are going up and short sells when markets are going down. This can be discretionary or systematic. Discretionary trend following means that a manager uses patterns as an input but uses judgement as the final decision on whether the particular pattern generates a profitable trading opportunity. It can be based on price patterns or fundamentals, but generally it relies heavily on the human touch, which means that human emotions can cloud trading decisions.

Systematic trend following also is based on pattern recognition, however once a signal is found to be profitable in the data, the trading activity based on the pattern is carried out in a systematic way such that no human intervention is necessary.

While trend following is the most common broad classification, some CTAs are involved in contrarian strategies, non-trend based pattern recognition, and spread trading (e.g. calendar spread, crack spread, or crush spread). CTAs can cover hundreds of markets and can have varying time horizons from mere seconds to weeks or months.

How profitable patterns are detected varies. Until recently, detection was based on humans testing different ideas in the data on different markets with varying horizons. More recently, however, with advances in machine learning, a human need only feed the computer the requisite data and the computer will sift through the data trying to uncover patterns that signal consistently profitable investment opportunities.

Historically, the CTA strategy has done well in bad times. CTA investing is considered to be a type of insurance policy. It tends to underperform in bull markets (1997 - 1999, 2003 - 2007 and 2009 - 2010) and overperform in bear markets (2000 - 2002 and 2008). While the CTA investing strategy's risk adjusted returns are on average not particularly high, it tends to do well when most other investments are underperforming.

SYSTEMATIC MACRO

Systematic macro is a strategy that aims to capitalize on mispricings around the world. It is a broad investment strategy that evaluates potential investment opportunities around the world and across asset classes. It includes investments made based on long-term broad global trends, or it can zoom in and focus on opportunities created from short-term cross-asset mispricings. The asset classes include equity indices, government and corporate bonds, currencies, commodities, and derivatives. The strategy tends to focus on highly liquid assets.

Systematic macro automates a trading strategy based on a set of investment rules. Its counterpart, discretionary macro, differs in that while it may use quantitative tools to help an investment manager decide whether to participate in an investment, the final decision is made by a human.

The types of rules systematic macro implements vary greatly. They can be trend-following based, whereby a systematic macro investor will buy assets that are rising and short sell assets that are following, with the assumption that prices are slow to incorporate new information and therefore will continue to move in the same direction. They can be contrarian, whereby the investment manager short sells assets that have recently risen and buys long assets that have recently fallen in price, with the assumption that prices have "overshot" their true value and will soon revert.

The rules can also be based on broad macro trends. For example, a systematic macro investor may have a system that models how commodity price changes can trigger currency price changes in countries that produce commodities. The investor's rule will then track commodity price changes but invest in different currencies based on the model's predicted relationship. Rules can also be based on a relative value system. If there are two assets that typically co-move together, in cases where asset A rises but asset B fails to move, the investor would short sell asset A and buy long asset B expecting the two assets to converge back to their historical relationship.

While the investment strategies vary widely, there are three characteristics that systematic macro strategies share: (1) they are not restricted to one type of asset class; (2) they are not restricted to one country; and, (3) they are driven by mechanical rules developed based on statistical relationship and theoretical models of how economics and asset classes are interlinked.

The advantages of systematic macro versus discretionary macro arise from a variety of dimensions. First, by automating the trading process, human emotion is removed from interfering with the decision-making process. Second, by automating the trading process, the strategy's performance should be replicable over time. Third, systematic macro can consider more complex relationships that a human would not be able to evaluate. Finally, the use of automation means a systematic macro strategy is scalable and can be implemented in several markets and across several asset classes simultaneously, potentially resulting in a more diversified portfolio and capturing more mispricings.

QUANT EQUITY MARKET NEUTRAL

Quantitative Equity Market Neutral (QEMN) is perhaps the most common quantitative strategy. Its name sums up several of its key qualities. It is quantitative. It is based in the equities market. It is market neutral. But this misses much of what the strategy actually entails.

First, quantitative here is meant very broadly. It implies that the strategy is automated and is based on an algorithm. It also implies that statistical tools are used to detect relationships that predict future price movements. Second, the equities market is where the tools are most commonly used, but most of the techniques developed in this space can be employed on other asset classes as well. Third, market neutral means the strategy uses long and short positions, saying that it is market neutral is too specific though. While its exposure may have a beta with the market of zero, it need not. The long and short exposures means that some of the market beta will cancel out, but obtaining a market beta of zero is not the primary goal. Instead, the goal is to capture both over- and under- mispricings.

QEMN covers many potential signals and strategies. QEMN strategies can be either fundamental or technical based. For instance, fundamental QEMN includes event-based investments. Following earnings announcements, firms that beat earnings tend to continue to outperform and firms that miss their earnings tend to continue to underperform. This phenomenon is called the post earnings announcement drift (PEAD). QEMN also includes more traditional fundamental analysis. Investment managers have developed automated models to value stocks based on their accounting information (in a similar way that traditional fundamental investors might), and will buy those firms that are estimated to be undervalued and sell short those firms that are estimated to be overvalued. The turnover of systematic fundamental strategies can be days, months, or even years.

QEMN technical based strategies focus on signals that are not related to the fundamental valuation of the company. For instance, momentum would be a QEMN strategy. An investment manager may buy stocks that have recently increased in value and sell short stocks that have recently declined in value. Momentum trading can occur at day or month frequencies, but also at hour or even second frequencies. Technical trading is broader than simply following prices though. It can also include relative value pairs trading, where an investor will track two stocks that move together closely and wait for breaks in the co-movement. The investor will buy one stock and short sell the other, hoping for the co-movement to reemerge. Or, for instance, an investor may follow limit order book imbalances and buy stocks that have a great deal of depth at the bid price but very little depth at the offer price, a sign that the price is about to rise.

There are an array of available tools and strategies within the fundamental and technical QEMN investment framework. A detailed categorization and explanation of these are beyond the scope of this article. Nonetheless, the tools used are wide-ranging, and include such technologies as machine learning techniques and low-latency computing abilities. These tools help facilitate the different approaches implemented in the QEMN investment framework (e.g. a high-frequency trading approach, event-driven approach, etc.).

Depending on the specific strategy, it is not uncommon for investment managers using QEMN to enter dozens or hundreds of positions (and sometimes even thousands), thus providing a diversified portfolio. Because the risk factors in equities are well

documented and there are specific assets that can capture these factors, managers can choose to hedge out specific factor exposures or can choose to increase exposure to a specific factor. While the assets are equities, QEMN provides different exposures than a long-only equity investment, and so it can be thought of as a separate asset class.

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