

NapoleonX

Smart competitive investing

Quantitative Management Goldpaper

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First version: Dec, 8th 2016

Current Version : V0.34

Date : Jul, 6th 2017

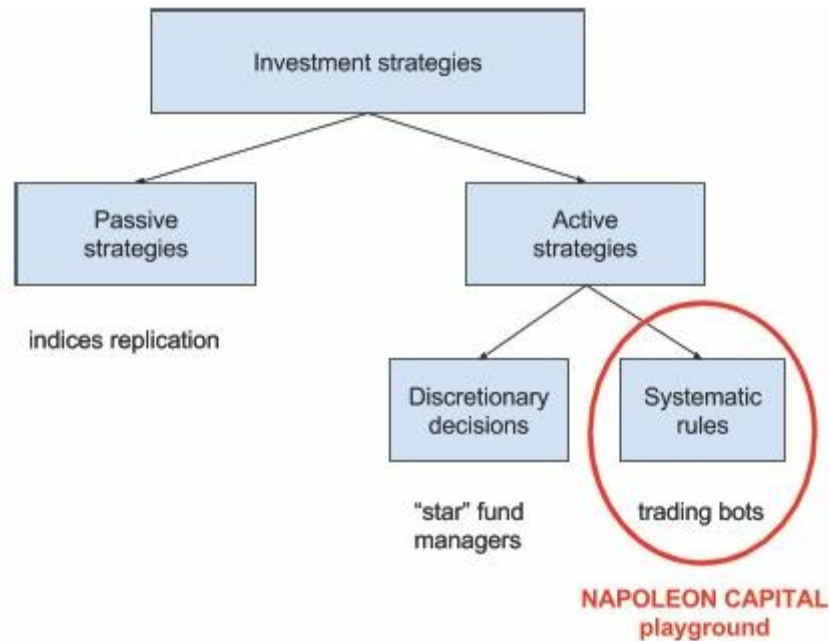
Abstract. Napoleon Capital has specialized in quantitative trading. Quantitative trading or investing is the most recent area in the investment management industry. You can date its beginning back to the nineties. A quant strategy is simply a rule-based strategy that will take decisions on behalf of the investment manager on a systematic basis. This strategy is often designed by the investment managers or by quant teams under their supervision.

The NapoleonX project aims at **delivering Smart Competitive Investing solutions to crypto-currencies holders**, through an open online computer driven asset management platform selecting best-in-class quantitative strategies (trading bots) from world class traders. Napoleon Capital has already conceived a set of overperforming trading bots that covers enough asset classes to feed this future platform.

This paper shall give to anyone interested in the NapoleonX project, the basic knowledge about quantitative investing.

Introduction

There are only two ways to invest on the financial markets: passively or actively. Having said that there are infinite ways to invest on the financial markets in the active management universe. You can achieve this by taking discretionary decisions, using systematic rules or a mixing both approaches. It has always been there even though through ages some methods have been more popular than others.



In the sixties to eighties, there have been several fund managers that have emerged, *Warren Buffet*, *Stanley Druckenmiller*, *Georges Soros*, *Bill Gross* to name a few that have championed the discretionary investment approach. These are landmark professionals with several decades of success. The real question is whether they have benefited from a unique historical macro-economic set up and have mastered this environment or whether they were the lucky survivors in a random walk journey. We will never know, but the market is always right, always.

The systematic investment world has also its champions like the *Ray Dalio* or *Jim Simons*. They are also veterans in the investment world. They may be less renown outside the financial world as what they do on a daily basis is less easy to grasp, but they are true genius. They are **able to read, interpret, model how financial instruments behave or should behave**. They rely on probabilities more than certainties. They combine these probabilities to design trading systems that can for some earn money almost on a daily basis.

The successful investors belonging to the discretionary investment group may very well be very well connected, have outstanding mind reading capabilities when negotiating transactions, understand very well their environment when doing a deal, be very well surrounded with the right advisors at the right time, be lucky or combine all these throughout the years. These investors are true storytellers, dealmakers, charismatic leaders or all this at the same time. It's easy to dream of replicating what they have achieved.

For the second group, **success is achieved on finding individual quantitative strategies, integrating them into portfolio of strategies** (think correlation), on **knowing how to measure risk** (or how much you should trade, where you should have your stop losses), on **understanding operational risks and liquidity impacts** of the quantitative strategies and on **being disciplined**. You also need to constantly research for new ideas, challenge existing ones and actively monitor your portfolio of strategies. You don't aim for the big killing wave but you patiently and steadily accumulate focusing on reducing your drawdown and controlling your risk.

To succeed in the second group, you need to have a completely different mind-set as in the first group. But being analytical, with outstanding academics, probability mastermind is not enough.

In 1998, LTCM a famous Hedge Fund went belly up despite its outstanding set up. You need to read beyond the matrix and to understand risk.

In this paper we will go through the main findings that we have covered in our long years of experience, being fully aware that the best is yet to come and that we will never rest in our conquest to understand and model the financial markets.

A look through Active management

A/ A few fundamental concepts of performances and risk measures

Is performance enough to judge of an investment manager's quality? What about risk measures? Indeed **risk and performance are usually interlinked**. The higher risk an investor is taking, the higher return he is expecting. What are the important concepts that should be analysed when studying an asset manager' performance?

Alpha

Often considered the **active return on an investment**, it gauges the performance of an investment against a market index used as a benchmark, since they are often considered to represent the market's movement as a whole. The **excess returns** of a fund relative to the return of a benchmark index is the fund's alpha. Alpha is often used with beta, which measures volatility or risk.

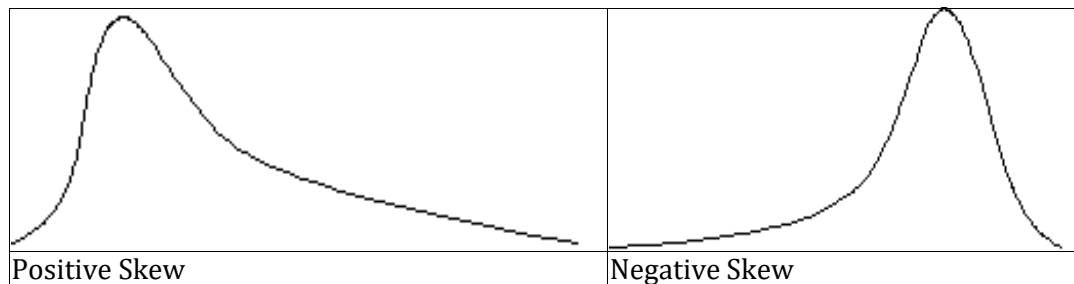
Beta

It is a measure of the **volatility, or systematic risk**, of a security or a portfolio in comparison to the market as a whole. Beta is used in the capital asset pricing model (CAPM), which calculates the expected return of an asset based on its beta and expected market returns. Beta is also known as the beta coefficient. It is calculated using regression analysis. It represents the tendency of a security's returns to respond to swings in the market. A security's beta is calculated by dividing the covariance of the security's returns and the benchmark's returns by the variance of the benchmark's returns over a specified period.

Skew

It can be mathematically defined as the averaged cubed <deviation from the mean divided by the standard deviation cubed. If the result of the computation is greater than zero, the distribution is positively skewed. If it's less than zero, it's negatively skewed and equal to zero means it's symmetric. For interpretation and analysis, focus on **downside risk**. Negatively skewed distributions have what statisticians call a long left tail (refer to graphs below), which for investors can mean a greater chance of extremely negative outcomes. Positive skew would mean frequent small negative outcomes, and extremely bad scenarios are not as likely.

A non-symmetrical or skewed distribution occurs when one side of the distribution does not mirror the other. Applied to investment returns, non-symmetrical distributions are generally described as being either positively skewed (meaning frequent small losses and a few extreme gains) or negatively skewed (meaning frequent small gains and a few extreme losses).



Sharpe Ratio

It is a measure for calculating **risk-adjusted return**, and this ratio has become the industry standard for such calculations. It was developed by Nobel laureate *William F. Sharpe*. The Sharpe ratio is the average return earned in *excess* of the risk-free rate per unit of volatility or total risk. Subtracting the risk-free rate from the mean return, the performance associated with risk-taking activities can be isolated. One intuition of this calculation is that a portfolio engaging in “zero risk” investment, such as the purchase of U.S. Treasury bills (for which the expected return is the risk-free rate), has a Sharpe ratio of exactly zero. Generally, the greater the value of the Sharpe ratio, the more attractive the risk-adjusted return.

What you have to look for from your favourite asset manager is a **positively skewed distribution** of returns with the **lowest beta** possible and the **highest Sharpe**. You can then **adjust your target return** using the **appropriate leverage** by either diluting his performance (think adding a cash component) or concentrating his performance (think borrowing cash to invest in his strategy).

Value at Risk

It is a mathematical approach to estimate the maximum future losses expected from portfolio, with a degree of statistical confidence. For example, if the VaR on an asset is \$ 1 million at a one-week, 95% confidence level, there is a only a 5% chance that the value of the asset will drop more than \$ 1 million over any given week.

Scenario Analysis

Scenario Analysis is typically employed as a complement to VaR. It measures the impacts of unusual events that might not be reflected in the typical VaR calculation. Risk analysts define different events, such as changes in interest rate, currencies, volatilities, asset liquidity, spread. After they compare the value of the portfolio before and after this events.

Stress models

Stress test complement scenario analysis. There is mainly three models: Factor push analysis, Maximum loss optimization and Worst-case scenario. In a factor push analysis the risk manager pushes factors to the most disadvantageous combination. Maximum loss optimization is a more sophisticated mathematical approach with computer modelling to find this worst combination of factors. Worst-case scenario is the worst case the analyst thinks is likely to occur.

B/ Discretionary investment

1/ Fundamental analysis

For this technique, discretionary decisions are taken on a regular basis by the portfolio managers based on his own experience and anticipation. **Trust in the portfolio manager is essential** for investors to subscribe in a given investment fund. Trust is built over the years as the investment manager is building his track record.

This is the **oldest active management technique** and **by far has been the most popular** in the past. Usually, investors want to try to understand where their money is invested and love hearing stories from their investment managers. Stories may not be simple fairy tales and may be backed by strong real facts. Investment managers are always interested in finding the next wonderful nugget. They rely on screening techniques to identify potential targets and then perform in depth due diligence relying on sell side analysis, industry analysis and interview with companies' management.

Their investment horizon is usually long term (3 to 5 years). For an investor such as *Warren Buffet*, investment horizon can be close to "infinity". He still owns his Coca Cola shares that he bought in the late 1980's. The belief for these investors is that it is difficult to forecast markets in the short term as they are inherently volatile, but that long term, good equity stories will play out.

Usually the investment managers manage their risk using basic rules in terms of diversification. On company may not represent more than x% of a total portfolio. A sector, may not represent more than y% of the total exposure. There may be limits on countries as well, on credit quality measure (for fixed income portfolio) These rules are usually included in the investment guidelines.

Even if investment managers have the ability to take decisions with a discretionary approach, they usually follow well-established strategies. For an investment manager, he may change his strategy over time or use a mix of strategies, depending on his anticipations. Below is a sample of the most emblematic strategies that exist in the market.

Value

The idea is fairly straightforward for this strategy: **finding companies that are undervalued** for various reasons and wait patiently that the financial market realise its mistake. The idea is very attractive to any newbie investor as it refers to the only one adage that would make any investor rich: **buy low, sell high**. However, valuation is more an art than a science. Indeed, how do you measure the cheapness of a company? Which financial indicator(s) should one use?

- its current or forward PE (Price Earning ratio) ?
- its historical PE ?
- its book value of its assets ?
- the discounted value of its future earnings ?

As you can see, there are countless financial indicators that could be used. Also, should they be used on a standalone basis or against market indicators /comparable on a more relative basis?

Growth

Investing in “growth” is a completely different story. Here, what you are looking for is the rise in future earnings. You may be an early stage of development of a company or more interestingly in its accelerating phase before reaching maturity. You are looking for the next Apple, Amazon, Google or Facebook. The focus should be less on operational efficiency and more on growing the top line (revenue) and the bottom line (net result).

These companies are easier to spot as you just need to look at the recent past (3 to 5 years) financial performance (based on accounting) to determine whether a company is fast growing or not. Of course, the market can see that too and will make you pay for that with higher PE than market average. You should also be vigilant to any sign that will point to any future deceleration in earning growth as company price is very sensitive to this one factor.

Long short

The above investment strategies are usually employed with long only exposure. It means that the investment fund cannot short a security even though it may be overpriced or with very little growth prospect versus its underlying price. In order to correct for this long bias and to increase investment opportunities, investment managers can opt to run a long / short investment funds where they could overweight “cheap” securities and underweight or short “expensive” securities. Fund managers generate two Alphas, one the long and the other on sell side. The fund global volatility is lowered, reducing systematic risk exposure and improving the performance to risk ratio.

High dividends

In the equity world, the investor remuneration come either from capital appreciation (increase in share price), or dividend payments and share buybacks. These latter have been very popular recently due to very low interest rate environment. One investment strategy will focus on dividend policies, dividend yield and dividend increase perspective vs the whole market of vs the fixed income market. Indeed, on a very long term basis, investor remuneration come $\frac{2}{3}$ from dividend payments for the market as a whole.

Usually, dividend policy is a very strong message sent by companies to their shareholders in the capacity to generate and sustain future gains. A company dividend policy will tend to smooth earning cycles. A company will avoid cutting its dividends in difficult time unless it absolutely need to do so to avoid sending panic messages to the markets. There is a strong resilience in these processes.

2/ Technical analysis

Technical analysis investing require a completely different mind-set as the basic statement is that security prices incorporate all fundamental news, including investment flow data. Some asset classes with less fundamental drivers than other like Investment managers using technical analysis assume that the market is right about pricing a security. However, they recognise that future price movements will likely follow known patterns that can then be exploited to generate profits. Here again, “reading” the markets is more an art than a science.

The main information that is used is security prices. However, trading volume information can also be used. This is very powerful, as **you just need to study price charts** as opposed to endless industry analysis, sell side analysis and to crunch long list of numbers. So the 1 million USD question is does it work ? Well it's complicated, but humans are programmed to recognize patterns. Countless numbers of books have been written on this topic.

Having said that, the first choice you need to make is what is your time horizon? Do you want to trade short term or long term? Markets have a tendency to repeat themselves at various time horizons. It would be very difficult to distinguish 10mn price chart from yearly price chart if there were no indication of timescale. Some characterise financial market as fractal, which was emphasized in a Benoit Mandelbrot book ("the (mis)behaviour of markets"), a must read. Usually, a fund manager would look at the same market at different time horizon (ex: 60mn, daily and weekly) and find patterns at these various timeframes in order to gain confidence for initiating a trade.

Below are some example of popular strategies / techniques that are used by investment professionals on a regular basis.

Momentum

Momentum investing constitutes one of the pillars for technical analysis. Here, you can think of buying a security when a short-term moving average cross to the upside a longer term moving average. As there is a tendency in the financial market for autocorrelation (ie tomorrow's return is correlated to today's return), these strategies work quite well and constitute the basis for CTA funds strategies. Herding is when investors trade in the same direction. It makes investors feel more comfortable because they are trading with the consensus of a group. The principal behavioural biases associated with herding are availability and fear of regret (we will cover it latter).

Mean reversal

The complementary investment strategies to the previous ones are the mean reversal strategies. The philosophy here is that price never go in straight lines. The markets have rhythm and it needs to take a breath at time. There are well known indicators such as MACD or RSI that can be helpful in anticipating risk phase in a price rally. This is very tricky to try to catch a bottom or a top as markets. One would say for in a falling market that it is dangerous to catch a falling knife, which is what a contrarian strategy would do in this case.

Japanese candlesticks

It is a special way to represent price chart using green or red rectangle depending on rising or falling markets. Several dozens of figures have been studied, each leading to preferred trades that can bet on either a trend to continue or to reverse. These figures give levels where to look for price confirmation or for placing stops. Some figures are very well known such as engulfing rising stars, hammer, Harami, doji, abandoned baby. Thus, they are build patterns based on prices used to predict price direction. Reliable patterns are detected by software scanners, scrutinizing different market places and allowing tactical opportunities into quantitative models.

Tom DeMark

If you can count to 13, then this strategy is made for you !!! This strategy is named after the name of its inventor, someone that is still providing financial advices to numerous market investment

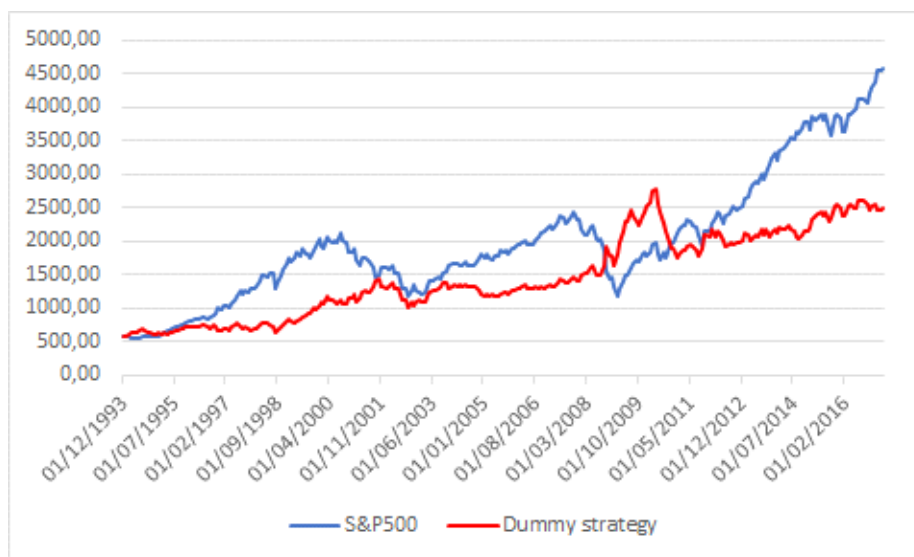
managers. This strategy analyse market rhythms and provide good risk reward transactions either playing the continuation of a trend or the reversal of a trend.

C/ Quantitative investment

Quantitative investing is a more recent area in the investment management industry as you may guess it, you need a computer and an IT infrastructure to support these activities. You can date its beginning back to the nineties. However, trend following techniques are much older and may be seen as the mother of all quantitative strategies. Japanese Candlesticks we have just introduced to you were already used in trading rice in 1600's!

So what is a quant strategy? It's simply **a rule-based strategy that will take decisions on behalf of the investment manager on a systematic basis**. The strategy may have been designed by the investment managers or by quant teams under their supervision. A "dummy" strategy would be to "buy" a security at the end of a month, sell it at the end of the following month and buy it again at the end of next month and repeat. This of course does not make sense from a financial point of view, but that is a strategy. It may even work for a few months if you are lucky. The second tricky question is what is a good quant strategy ? Well, it's a strategy that works of course !!!

So if you think about it carefully, any strategy on a security will create a new security. Wow, that is a gigantic statement. You may not realise it but that is the case. If you come back to a "dummy" strategy of buying randomly 70% of the time and otherwise selling, you can see below this strategy for the S&P500 and contemplate the differences.



Before going into much more details, we will give some example of quantitative strategies that are very popular in the investment community. You may have heard about some of them. You may recognised some strategies described in the discretionary section above. There is always some porosity between the various investment techniques. Purity is not part of this universe.

Index optimisation

Equity / fixed income index have been around since ages and asset allocation / benchmarks usually refer to them. However, one has to realise that an Index is calculated on a daily basis based on quantitative rules. However, there are regular "discretionary" committees to validate index

constituents. That is why on a long term basis, index tend to grow because of this survivor bias embedded in its construction.

So are these index optimised? Well it depends on what you are trying to optimise. But most of the time, these index are fairly basic. There are current strategies (low vol strategies) that will take within a broad universe (ex: Stoxx 600) the 20% least volatile stocks and equal weight them. Doing that pose the risk of over representing a low volatile industry sector. So you can also select low volatile stocks that sector per sector and use the various sector weight when composing your new index.

Another way to optimise a broad equity index could also be to select stocks that meet certain criteria such as dividend yields above a certain threshold or 20% highest dividend payers. You could also try to optimise your index based on growth or value criteria that you could define. In fact that would be a very good exercise for the discretionary investors that would try to sell you an investment bias that is generating a profit.

Smart Beta

This subcategory has grown very popular over the last decade and is almost an entire asset class. This is sort of a quantitative balanced portfolio that can also on-board leverage monitoring in its strategy. This is very powerful but hasn't really been tested in adverse market conditions, especially on the fixed income market side. The use of leverage in these strategies could also pose a threat should a fixed Income crash occur in the years to come.

Once again there are several type of multi asset allocation used for these kind of strategies. A popular one is where asset allocation between the various asset is fixed and the leverage varies according to pre-defined bands. There are regular rebalancing to correct drift in various asset performance that are defined in the fund prospectus.

Trend following strategies / Mean reversal strategies

These strategies might be ones of the oldest strategies around, ones that have been extensively used by CTAs either on a discretionary or semi-automatic basis and that can be systematised.

Trend following strategies will tend to trigger buy or sell signals based on trend indicators (ex: based on moving average). These strategies will prove very powerful to ride long lasting trend without exiting too early. For example, if the 20 day moving average cross the 50 day moving average, the strategy could trigger a buy signal.

Mean reversal strategies are complementary to the previous ones as everyone knows that trend do exhaust at some point. So it is always very tempting to either exit a trend or even take the opposite trade. But this is a risky business and you'd better have a well-defined game plan in place before doing so.

Risk parity

This is a fairly recent strategy that embeds risk management in its asset allocation. This has been the one successful approach of Ray Dalio from Bridgewater since several decades that is starting to being democratised. Pocket of risk are being allocated to various asset class as opposed to a simple asset allocation. Given a risk budget, a position size is then determined which depend on its "risk" usually measure with some sort of volatility measure. This allows a fairly balanced risk contribution from the various asset classes to overall portfolio risk. However, this can be

dangerous in the case of an abnormal low risk measure for one of the asset classes in the case of a sharp and unexpected reversal.

Market neutral

This strategy also uses long and short positions but focus on achieving a zero beta exposure (systematic risk). Securities are selected by a more specialized mathematical process mainly than by a fundamental valuation with long short fund. By delivering absolute return performances with zero correlation with its index, investors can be better diversified. In others words, it aims delivering returns in up or down markets.

Behavioural finance

Behavioural finance has gained strong interest after recently advanced research, including Nobel laureates Robert Shiller and Daniel Kahneman. It is a descriptive approach, focusing on how individuals behave and make decisions. **It draws on concepts of psychology and neuroeconomics.** Individuals are subject to cognitive errors and emotional biases. Investors, even the more experienced and educated ones, are bad at processing new information. Human brain cannot grasp all available information and take, at the same time, quickly optimal investment decisions. Below some brief descriptions of cognitive errors and emotional biases. To name a few:

- *Availability bias* : putting undue emphasis on the information that is readily available
- *Fear of regret bias* : feeling that an opportunity has passed
- *Loss-Aversion bias* : when investors focus on loss aversion (think gain/loss) instead of risk/reward ratio, actual fundamental valuation or technical analysis.
- *Anchoring bias* : a tendency to attach (anchor) our thoughts to a reference point.
- *Confirmation bias* : a tendency to look for new information confirming your original forecast.
- *FOMO* (fear of missing out) : a pervasive feeling that market participants are enjoying an investment you are not.

There is plenty of others biases not explained here. While theses biases could be obvious for you, they are still affecting financial markets by wrongly driving some assets on irrational prices/valuation. **One of feature of quantitative strategies is to not be subject to theses cognitive errors and emotional biases, allowing to exploit market anomalies.**

Quantitative Management

A/ Outperformance vs absolute return approach

When managing a strategy, your investment objectives should clearly be stated. Is the investment manager objective to beat an index within certain risk rules or to generate absolute performance? Does it matter in the end as you can transform one approach easily into the other? Imagine you have a strategy that buy or sell the Eurostoxx 50 index and that generate an absolute performance. If you had this strategy with a certain "size" to a long index position you then have an index plus strategy.

Alpha generation usually refers to the absolute return universe. However, in the past alpha generation turn out to be related to high beta strategies as exposed during strong market reversal. Beta generation is thus more associated with index outperformance.

What people don't realize is that **you can synthetically create your own mix once you have basic alpha and beta strategies. It is only a question of structuring.** But the starting point is these elementary performance bricks. You should always try to discover where the money is being made to make sure that the strategy that is pursued will behave according to your expectations in identified market environments. Easier said than done to be honest and only professional can help the majority navigating through these important subtleties.

B/ Limitations

There are almost no limitations to what the brain can imagine except that when facing an ocean of data, it is very difficult to have the data starting to talk. You need to have spent long hours just observing the financial markets to try to model them and some financial investor behaviours. Is it enough? I'm afraid the answer is negative as if you think that the data you find everywhere, including at the exchange where index are calculated, are accurate and "investable", you are dead wrong.

As in any data project, the first thing you need to do is collect data, observe them, interpret them from a business point of view and clean them if necessary. There is no other way to proceed. How do you know when you see a data that it is accurate? Well experience and business insight cannot be easily replaced. Should it anyway? These multi-steps usually represent 80% of your efforts in a normal data project. Luckily, with all data providers around, this is a much cheaper effort these days but you cannot overlook the business insight required to use the collected data.

On some occasion, you have wonderful data with a wonderful model, however the data the model is built on is not investable or when you find a security that tracks your data, your edge may simply disappear. The VIX is the perfect example for that. It has tremendous mean reversal behaviour but unfortunately, the only way to track the VIX is through the use of VIX futures. The difference between an index and a corresponding future is called the basis and may depend on interest rates, dividend expectations, and market anticipation ... Once you factor in the basis, a strategy developed on an index that is only investable through futures may completely disappear.

Another subtle limitation is when you find a superb investment strategy that uses the anticipated security price into account to forecast itself. It is a classical mistake that would be quant might fall into at the beginning of their career. This is not always easy to spot and when you only take into account the security price of the previous period, your edge may simply vanish.

C/ Autocorrelation (GARCH models)

Any quant strategy will have some relation to statistics. You cannot properly develop quant models without having basic notion into statistic. That does mean that you should be an expert, but at least you need to have the basic reflex. One advantage of this is that the first thing you are taught when studying a time series is to look for statistical independence of your variable.

Definition: in probability theory, 2 events are independent, statistically independent, or stochastically independent if the occurrence of one does not affect the probability of the other. Similarly, two random variables are independent if the realization of one does not affect the probability distribution of the other.

Well **for most of financial series, autocorrelation is very strong.** So what are the implications? Tomorrow's return depends on today's return. But then also on yesterday's return by transitivity and so on. OK, how do I use this information? Well you study GARCH statistical models that deal with autocorrelation of time series. I am not going to develop any further as it is an open research subject. All you need to know, is that you can develop quantitative strategies around this concept that are pretty powerful and which results are persisting regardless of market conditions.

D/ How to start developing a quant strategy: measures and fixed points

Well, how would you orientate yourself in the space without the use of a map? What is crucial on a map to know where you are going? Simple: a scale and fixed points. Well when you start analysing financial data, you can picture yourself as in the middle of nowhere and you are trying to go where you will achieve a financial objective to either generate alpha or beta. This sounds a little bit theoretical but it is almost what you are trying to do.

So how to find the right scale, the measure unit? Well on a true map, this is the small ruler that makes one meter/km in real life corresponds to x cm on your map. This is a constant. However, observing financial markets make you think of chaos. So why should this measure be stable overtime? Remember that risks are embedded in markets and it has to be reflected somewhere in your approach.

Some example of measures could be realised volatility, implied volatility, high – low or some function of this difference ... Having said that, over which horizon should be defined the scale? Once again, no easy answer knowing in any case that autocorrelation is strong in financial series.

And the fixed points? Are they that fixed? Well of course they are not !!! They cannot be. They move with the markets. If you are pursuing a trend following strategy, you could take some moving average as your fixed points. Depending on how they are organised, your strategy will tell you to go into one given direction or to stay where you are.

Once you have defined your scale and your fixed point you can start progressing in the various direction ie take either long or short positions or do nothing. Game on !!! But hold on, how much should you bet for any of your trades? Well, we will cover this topic later on. Stay tuned.

E/ The Grail

As explained at the beginning, every investor should be looking for strategies with the most positive skewed distribution of returns, highest Sharpe and lowest beta. Also, these statistics should not be based only on a single regime for financial markets but should be **relatively stable regardless of market conditions**. This is the marker of a strategy that is not linked to special events that are not repeatable but a strategy that may be linked to either structural market imperfections or human bias.

F/ Diversification, still a useful tool

In practise, it is not always necessary to aim for single strategy with Sharpe above 1,0-1,5x as you can combine such strategies as long as they are not correlated and thus build your own strategy that will have a Sharpe ratio that can climb above 2,0x.

Another interesting measure is the excess return against the highest historical drawdown. Indeed, your maximum risk is when you are facing your largest drawdown, hence any combination of strategies should aim to reduce this risk measure while preserving your return.

G/ Money management, a way to enhance risk / reward profile

Once you have a strategy that produce a “good enough” return by providing buy and sell signals on a security, you can also improve this strategy by adding an “independent” money management module. Traders or even poker players are earning regular money not only because they have an edge (positive expected return) but also because they have a money management strategy. This one will usually help in measuring “risk” and define bet size accordingly.

For example, risk parity funds measure the various asset classes that they are investing in using volatility and size their various asset bets using positions that are inversely proportional to volatility hence providing asset bets with similar risk levels. Of course, to do that, you need to be able to include leverage in your management, especially when volatility is abnormally low.

H/ Operational issues: impact of execution costs

It is not sufficient to design a trading system that will generate a positive expected return on your data set if for example you cannot find a security that track your data set (ex: VIX is not an investable asset).

Another classic pitfall is the execution costs. The execution costs are made of:

- brokerage costs (direct costs)
- bid / ask spread
- market impact (for large orders)

All these costs can have a negative impact on one designed strategy and should be estimated before starting trading on a theoretical idea. It might be challenging to assess all these costs as they are not always observable.

For example, if you are trading a strategy on equities at the closing of a market where you have an auction, you will not bear any bid/ask cost as each one is executed at the closing price. However if your size is fairly large versus normal market orders, you will influence the level at which markets will close due to order imbalance. This might be difficult to properly assess.

A quantitative model executes orders with minimal risk and costs. Basically, it breaks a large trade into smaller pieces to accommodate normal market flow. By adapting the size of the order, it is not notified and thus it takes advantage of changing market liquidity.

Conclusion

We have covered the various elements that are important for the assessment of the quality of a quantitative strategy. We have also seen that to build a robust global strategy you don't necessarily need outstanding single strategy as you can diversify your overall risk (either measured by volatility or better the maximum drawdown) by combining uncorrelated such strategies.

However, you don't want to use too many strategies for practical matters, hence the single strategies should meet minimum criteria in order to target 5-10 strategies that one investor should invest in in order to achieve a 2,0x or higher Sharpe. You also want to have some stability on your strategies' return in order to weather all market conditions as it may be challenging to anticipate such regime changes that are by nature unpredictable.

Between the two active investment strategies, discretionary and quantitative, we are convinced that the second will continue growing at the expense of the first. Some people simply argue that this mutation is just driven by fees reduction incentives. Fundamental analysis are conducted by sell side and buy side analysts who are paid by brokerage fees or by the fund asset company. In fine, that's result in management fees (up to 5% per year) and trading fees paid by investors, reducing investment performances. **We can illustrate discretionary investing as an art and quantitative investing as a science!**

Quantitative management is a rule based process, essentially supported by statistical and mathematical models. **Benefits for investors are meaningful**, not only offering low-cost vehicles:

- ✓ Dynamic models to adapt in market trend changes
- ✓ Implement a total or partial automation of investment decisions
- ✓ Enable customized risk/return portfolio construction for each investor profile
- ✓ Ongoing monitoring of market risk on governance of hedging and leveraging levels
- ✓ Independence: not relying on few star fund managers with a static approach
- ✓ True reward of models contributors based on performances

The NapoleonX Project

The NapoleonX project is an open online computer driven asset management platform selecting best-in-class quantitative strategies (trading bots) from world class traders, where each crypto-fund dedicated to a specific asset class shall enhance the traditional model by improving its governance through smart contracts' implementation.

The NapoleonX project will be **the first implementation of Smart Competitive Investing solutions dedicated to crypto-currencies holders. We aim to bridge the gap between crypto-currencies holders and quantitative investing by implementing a revolutionary investment platform built on Ethereum's decentralised blockchain.**

A huge market and a timely moment: Only a minority of investors have access to highly performing investments funds due to high initial capital requirement, physical trade constraints, operating costs on capital flows.

With the ongoing development of a derivative markets for cryptocurrencies in developed countries (swaps, futures with physical delivery, options), the integration of crypto-currencies payment solutions on Visa and Master cards, the relaxing legislation on crypto-assets occurring in many countries, **we believe to be the right moment to develop a disruptive investment opportunity.**

For the NapoleonX project, we have already developed overperforming strategies over different time horizons for various asset classes (equity indices, Gold, BTC, FX, credit ...). These strategies are sufficient to start managing a portfolio of quantitative strategies. However, we believe that other in the markets have also developed strategies that meet our requirements and that could be complementary. That is why at Napoleon Capital, we aim to attract such traders in order to combine our strength, while we will continue to develop new strategies, as R&D is an important component of quantitative management.