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QueensField AI
Technologies

White Paper

Extracting performance from large cap. Equities

"EquityEdge-Tech: combining thought leadership with Machine-Learning techniques"

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Executive Summary

In order to identify how to create value in the space of large cap equities, which is considered as highly efficient, we need to come with a few very clear ideas articulated in an innovative manner.

The four core intuitions, which drive our approach, are the following ones:

1. *Risk should be forward-looking: Any informative measure of risk needs to be forward-looking. The analogy is that nobody crosses a street with closed eyes, only looking at the past statistics of injuries.*
2. *A stock is not a company: The price of an asset combines its future cashflows with a discount factor. The dynamics of this discount factor, which represents the Relative Risk Appetite of investors for this asset versus its peers, lies in a largely unchartered territory. In our view, this is where value can be found.*
3. *Ternary regimes: It is well documented in the academic literature that Equities follow regimes. Where we bring value is by clarifying that one should not be talking of binary regimes Risk-On / Risk-Off, but of ternary regimes Risk-On / Rebound / Risk-Off.*
4. *Market crashes are Bottom-Up driven market runs resulting from a very low investment appetite for a large majority of stocks.*

In order to generate performance in efficient equity markets, the point is not primarily to spot a few assets displaying misunderstood idiosyncratic future cashflows, but to capture on all assets the relative preference dynamics of the community of investors.

In this respect, we need to address the four above points. The first one should help us develop a granular and forward-looking risk metric informing us about the risk associated with industries, sectors. The second one leads us to a powerful single stock 'skill' rating, which may either inform a selection process or an allocation methodology based on the assessed level of relative skill. The third one should tell us when to prefer which investment style, based on the regime investors are in. The last one is meant to tackle the specific case of signalling market crashes.

What is QueensField AI Tech delivery?

Based on advanced AI techniques, QueensField AI Tech generates on a daily basis:

- *Low frequency shifting risk regime data related to geographies, sectors and industries.*
- *On each stock in the SP500 and the Stoxx600 a Skill Rating A, B or C, which is commensurate with future expected performance, while only shifting 2 to 3 times a year.*
- *A Market crash indicator per geography*

We consider that the data toolkit we offer is useful if it allows us to extract ~500 bps excess performance or to properly smooth the trajectory of equity portfolios thanks to an appropriate low-frequency dynamic allocation.

1. What is QueensField AI Tech approach to data usage and AI modelling?

The data used at QueensField AI Tech is primarily price information, either stock price or option data, on as large a scale as possible. The frequency of this data is daily. In all the spectrum of models used, we pay particular attention to the sequential nature of this data.

Wherever possible we adopt a bottom-up approach, consisting in aggregating views at the most granular level (single stock, horizon/moneyness levels), in order to draw conclusions at industry / sector / geography levels through a combination process. This approach is meant to enhance the reliability of the outcome.

From a modelling perspective, all the classes of models have similar hyper-parameter characteristics across industries, sectors and geographies in order to deliver robust results.

In terms of modelling standards, we rely on a variety of innovative techniques:

1. Wavelet decomposition for data smoothing and denoising.
2. Bayesian graphs on supervised learning problems.
3. Transformation of the data into spectral vectors derived from audio techniques
4. Variational Auto-encoders for dimensionality reduction, delivering a sparse bottleneck vector
5. Extended HMM to articulate regime changes
6. Bayesian graphical models applied to ranking contests (Quantized Belief Propagation model)
7. Attention models to manage memory (Transformer model)

Using the above techniques, we look at the data from different angles:

- Option data transformation into Discount Factor and Risk Aversion data
- Time series decomposition and re-aggregation into condensed risk information
- Return information transformation into relative Skill ranks
- Embedding of the information associated with stocks as input to models
- Dynamic memory drawing

2. Describing the core intuitions

In our view, Active management has been struggling not because it is bound to do so but because it often believes in the following erroneous assumptions:

- Measuring market Risk means looking backward.
- Selecting a Stock exactly means understanding a Company.
- Equity regimes are binary on/off
- A Crisis happens when macroeconomic indicators deteriorate.

Let us go through all these points one after the other.

2.1 Risk cannot be measured purely looking backward

When asset management experts measure risk using statistical measures such as the volatility, VaR, CVaR, etc. they rely purely on past information but do not incorporate the

fact that this information is ordered and sequential. The idea that Risk is measured through a statistical distribution of past outcomes has certainly some merits but is far from being sufficient: it suggests a very coarse frame.

What traditional Investment strategies such as momentum, trend-following, mean-reversion, etc. tell us is that the sequentiality of the data, even considered in a naive manner, brings value beyond looking at distributions. In other words, a more complex frame than grouping past information into a distribution is required.

The development of Machine-Learning / Deep-Learning enables us to learn some refined framing rules based on a very large set of past experiments and datapoints, which can then be commingled with recent / coincidental targeted information to deliver a forward-looking risk message.

This idea that a Risk assessment results from the combination of a refined learned frame combined with focused information is extremely innovative and clearly establishes a new standard in terms of Risk Management.

2.2 *A Stock is not a Company*

When a Company communicates, it usually talks about its future expansion projects, its future cashflows, the degree of satisfaction of its clients and its forward-looking pipe-line of activity. The degree of transparency of listed companies has increased massively over the past years in this respect making alpha scarcer and the community of analysts is focusing on identifying as much remaining unknown as possible, adding to this picture the information coming from talking to different firms active in the same sector.

This being said, a Company is not a Stock. A Stock combines the information coming from the Company itself with the degree of appetite of the community of investors for this Company. Understanding a Stock means getting to know the Company but also deciphering the evolution of the degree of interest of investors for this Company.

The Stock is characterised by a price and this price combines (i) specific information on the Company with (ii) preference-based relative information with respect to other stocks, i.e. other corporate opportunities.

This reads in the components of the Price:

*PRICE = FUTURE CASH-FLOWS * DISCOUNT FACTOR*

The Future Cash-Flows summarize the corporate story told by the Company.

The Discount Factor tells us the extent to which the community of investors buys into this corporate story, in comparison with other corporate stories from other Companies, given macroeconomic circumstances. This is all the more important, as mathematically speaking, the derivative of the Discount Factor on the current price level is the Arrow Pratt Relative Risk Aversion measure.

As a result, looking purely at the information, which relates to the Company, in order to infer a better understanding of the dynamics of the corresponding Stock is poised to be quite noisy at best.

At the core, looking at Equity risk means delivering a time-varying assessment on the relative preferences of the community of investors towards each instrument.

2.3 Advocating for ternary regimes

In the early 2000, several seminal articles have been produced describing the existence of regimes in equities[1]. Many people have looked at regimes mostly from a volatility perspective. Because we are looking at both returns and volatility, our view is that the states of risk are better described by Risk-On / Rebound / Risk-Off because putting things in a simple way, Risk-On combines positive returns with low volatility, Rebound positive returns with high volatility and Risk-Off poor returns with high volatility. We have observed that each of these three regimes tend to display a probability of occurrence of $1/3$ over the long run. This explains, by the way, why long-term investors tend to be much more invested in equities than short-term ones, as the former tend to position Rebound periods aside the Risk-On ones, while the latter tend to assimilate Rebounds with Risk-Off periods.

On occasions, we prefer Overweight / Neutral / Underweight as a ternary signal when we are talking about probabilistic trends, with Overweight meaning trending towards Risk-On, Neutral towards Rebound and Underweight towards Risk-Off. Because we generally prefer Bottom-Up signals to Top-Down ones, the aggregation of the Bottom-Up information is often displaying trend changes rather than clear outcomes and there is value in identifying such changes, hence a milder message.

2.4 A market crisis is a Bottom-Up event above all

There are more macroeconomic crises than market crises. This is what makes the job of Active managers a difficult one. Will Fukushima turn into a market crisis or not? Will Tapering create a market crisis too? Is China Real-Estate a real threat to markets?

Getting things right using macroeconomic indicators is a difficult task. Qualitative heuristics tell us that a crisis usually comes when macroeconomic situations, liquidity conditions and valuations all deteriorate at the same time, but there is no guarantee attached to this recipe. To say things in a more elaborate manner, it is difficult to infer a market crisis from Top-Down macro indicators.

In fact a market crisis simply emerges when the community of investors does not find interest anymore in a large quantity of stocks at once. A market crisis is a 'Market Run'. Conversely a market crisis disappears when the community of investors starts to see value again in a sufficiently large number of stocks and carefully tiptoes back into the market. (By the way, the number of stocks they get attracted to again does not need to be very large).

Assessing the entry or the exit from a major crisis 'simply' means counting firms, like counting beans. It is not as easy as it seems however, as the expression 'counting firms' needs to be clarified. What we mean by this is for each firm contributing meaningfully to the market (in the US for instance the components of the SP500), assessing the degree of Risk Appetite of investors. When for a large majority of such firms, this degree of Risk Appetite is getting very low, we come to the conclusion that there is a 'Market Run'. In practice, we have observed that the threshold is at a 85% /15% level. When only the bottom 15% hyper-defensive stock threshold gets breached, an Investor capitulation is taking place. Conversely, when this tipping point is being crossed on the way up, we have a very high probability to see the green shoots of a recovery.

In order to deliver value to his / her clients, an Active asset manager needs to put the community of investors at the centre of his / her decision making process, whether it is in terms of psychology of risk, of relative risk or of risk herding. This should be done above looking for some idiosyncratic alpha on a few misunderstood stocks. This is the central message conveyed by

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[1] How Regimes Affect Asset Allocation A. Ang and G. Bekaert, Financial Analysts Journal Vol. 60, No. 2 (Mar. - Apr., 2004), pp. 86-99 or Asset allocation under multivariate regime switching
M. Guidolin, A. Timmermann, Journal of Economic Dynamics and Control 31 (11), 3503-3544

QueensField AI Tech and this is the real added value, which can be provided by Artificial Intelligence, not to create black boxes but to better understand Investors as individuals and as a community. Getting this right should help Active managers to create excess performance on a large scale.

3. Practically speaking, how can QueensField AI Tech help Active managers?

3.1 Regime identification to either reduce the allocation or shift styles

Investigating regimes is a rewarding exercise, as long as they are captured early, they last over a significant period of time and they do not lag recovery periods too much.

Having a diversified toolkit of forward-looking measures of risk enables us to leverage the strength of each approach. As an example, the information extracted from option data is extremely powerful to detect the exit from Risk-On or Rebound periods, while analysing the comparative behaviour of short / long term investors or measuring the number of stocks triggering investor appetite tells us a lot about exit from bear periods.

The information about regimes can be used in multiple ways and we have selected two of them:

Depending on the regime we are in, we may decide to over / under allocate to equities. We might also decide which type of style to select, looking to favour Growth stocks during Risk-On / Overweight periods and Low Beta during Risk-Off / Underweight periods. These two approaches deliver value in excess of relying on the corresponding naked equity index.

3.2 Selecting Stocks / Assets based on Skill

Selecting Stocks means in our view identifying investor perceived corporate talents, not just corporate talents. In order to understand the difference, let us take the example of a cement company, which dominates its peers in an industry which counts among the highest CO_2 polluters. From a corporate perspective, its management is doing great but from a market perspective there are many more palatable opportunities in other industries.

Looking at the Companies themselves it should be possible to identify the talented ones driven by a skilled management and for such companies the talent is likely to be stable over time like the talent of a chess GrandMaster is resilient over time. When we superimpose the market preference perspective, we introduce variability. We move from stable talent assessments to locally stable talents. Selecting stocks therefore means in our view ranking stocks and choosing them based on their identified 'locally stable talents'. We are not talking about frequent rebalancings but there should be some on a semi-annual / annual basis.

At **QueensField AI Tech** we have spent a lot of time to capture 'Locally stable talents' and to understand the dynamics of their evolution. In order to do so, we typically consider three layers of observation:

- At a Sector level (there are 11 of them in the GICS classification), how can they be bucketed in terms of preferences?
- At an Industry level, within each Sector, how can we tier them?
- At a Stock level within each Industry, how can we identify top-ranked firms?

A stock is characterised by its 'signature', a 3-dimensional vector telling us the positioning of its Sector among peers, the positioning of its Industry within its peers in its sector, its positioning versus its peers within its industry.

In order to get to such 'signatures' for each stock in a geography, we have developed a unique AI technology based on local skill identification over 100-day periods, combined with joint, full universe, skill evolution analyses based on advanced dynamic memory models.

In practice, by focusing on this relative Skill Rating, we are not looking to extract some idiosyncratic hidden alpha, but to capture the stocks displaying skill given the market conditions. As a result, the information can either be used to select the top rated stocks or to adjust the weight of already selected stocks based on the level of Skill rating.

3.3 Detecting sudden entries in and exits from market crises

Skill, talent need time to express themselves. A good manager is not a person who always gets things right but somebody who rather gets things right and in the end makes a difference. Skill plays and pays in the Long-Term.

On the flip side, Tail Risk is often a matter of Short-Term decisions. Looking at 2008, 2011, 2015, 2018, 2020, we have even seen a shrinkage of the length of the 'pre-shock' periods. As a result of this, the time left to adjust for Tail Risk has reduced quite dramatically.

In order to monitor market crises, we therefore need Risk indicators, which are pretty reactive at a single stock level. At the same time it is critical to avoid false starts, which hurt the credibility of any crisis signal.

In order to count meaningful things, we have put together four indicators on each stock, which are combined in order to deliver a point-in-time single stock Risk score:

- Looking at option markets, what is the risk perception on this stock?
- Looking at the dynamics of the price of this stock, what is the degree of stress / turbulence it conveys?
- Looking at trends, is this stock exhibiting some directionality?
- Are all the above indicators applied to each stock relevant and have been reliable historically?

Once we have such point-in-time Risk scores for all the constituents of a universe (e.g. the stocks in the SP500), we can count the proportion of stocks triggering market interest and infer a Distance to Shock, which in turn is translated into a probability of a Shock.

What makes us comfortable is that it did very well in Q1 2020 during the Covid-19 period, both at the entry and at the exit levels.

4. Delivery: data and solutions

Thanks to the EquityEdge-Tech data platform, we provide the daily information update on sector and geography regimes, on market crashes and on single stock Skill Ratings either in a visualisation format or in an API format.

Besides the data itself, **QueensField AI Tech** has developed a financial engineering capability for institutional clients in order to build some strategies either targeting a "smoother investment journey', through stock selection or stock allocation, or else looking to extract absolute returns.

The applications we have been working on:

- Fixed Indexed Annuity US business
- Risk reduction on active / passive instruments via dynamic weighting
- Stock selection for Hedge Funds

DISCLAIMER: EquityEdge-Tech is a generic information tool delivering signals. It is not meant to deliver any specific Investment Advice. Users may only relate to these signals based on their own judgment, depending on what is suitable for them. In addition, please note that the performance displayed in association with the EquityEdge-Tech signals does not correspond to an actual investment performance, but relates to research results and simulations. It does not include any fees and costs. There is no assurance that a management allocation implemented in practice would deliver similar investment objectives.