



Rothko: 4 Years of A.I. Driven Alpha

Quarter 3, 2017

In September 2017, Rothko Emerging Markets All Cap Equity LP passed its 4-year anniversary. It has been a successful 4 years for the strategy, with solid multi factor alpha generation, even in a difficult market for value investing. While Rothko is first and foremost, an income oriented, value approach, in this piece we shed some light on the deep alpha sources we have tapped over the past 4 years. This has been driven by Rothko’s artificial intelligence (A.I.) based approach.

No More “Catastrophic Forgetting”

Since a CFA survey in 2006¹ identified 100% of “quants” use simple linear factor models (after Fama and French), “factor investing” has become an ever more crowded and therefore dangerous space. At the same time a surge in “machine learning” power and a rise in data quality has now created an opportunity for more sophisticated ways of making sense of alpha opportunities.

Outside the world of asset management the take up of this technology, Machine Learning (a precursor to A.I.), has been marked by the rapid increase in demand for ‘A.I. enabled’ processors chips, GPUs, and the huge increase in processing power illustrated by the development of Google’s proprietary ‘A.I. processor’, the TPU2 (see Exhibit 1).

When correctly applied to investments, certain A.I. approaches do not have to make the oversimplified assumption that equity prices follow straight lines with respect to stylized risk factors. They can incorporate human insights and thought processes to anchor an approach in reality, while extracting knowledge from the universe of data using high dimensional techniques. Perhaps most importantly, A.I. approaches can be designed to try to “remember” past events and their meaning for risk and opportunity (see Exhibit 2). The alternative – catastrophic forgetting – is adequately represented by the performance of naïve quantitative models; to catastrophically forget the leading indicators of value traps and past “quant crashes”.

Exhibit 1: The Rise of the A.I. Chip...

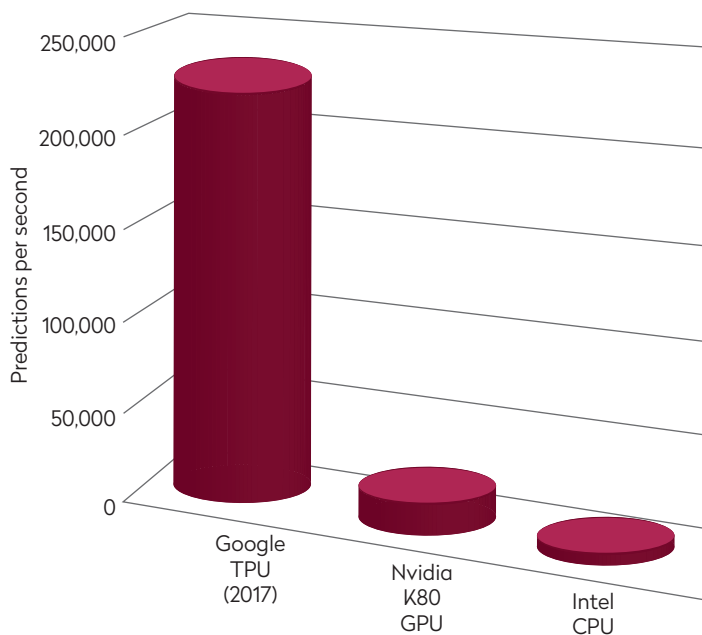
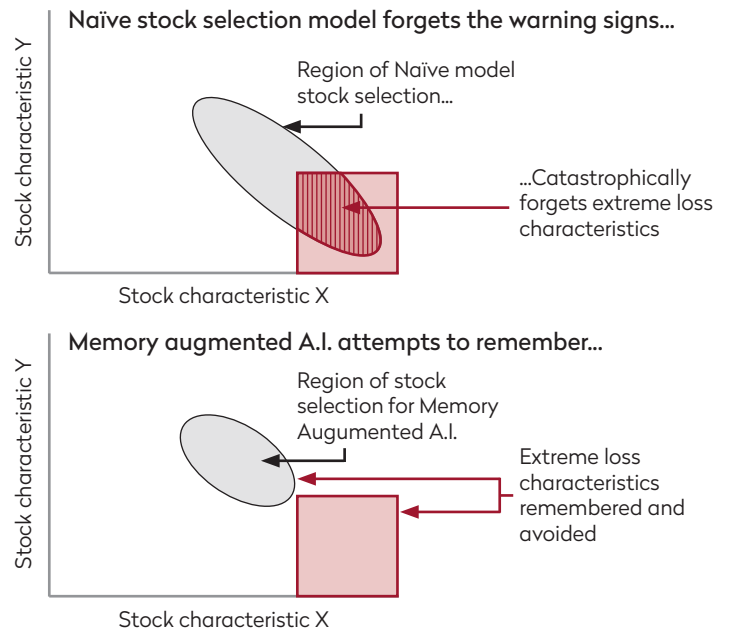


Exhibit 2: Remember Not to Catastrophically Forget



¹Trends in Quantitative Finance, Frank J. Fabozzi, CFA, 2006.

²The Tensor Processing Unit (TPU) is Google’s custom designed chip for the processing of massively parallel floating point calculations and therefore calculating the key numerical operation (matrix multiplication, or tensor product) used by the most widely employed AI technology, deep neural nets. Development has been secretive but the 2nd generation TPU (May 2017) is thought to be around 200x faster than a standard NVidia GPU.

³Catastrophic forgetting” is the idea that a model calibrated against the recent past “forgets” key events in the more distant past. This expression describes almost all the models known to currently be applied in quantitative finance in general and is a subject at the cutting edge of A.I. research. It is highly likely that the models operated by the biggest losers in the quant crash of 2007 would fail to identify the precursors of a similar future event.

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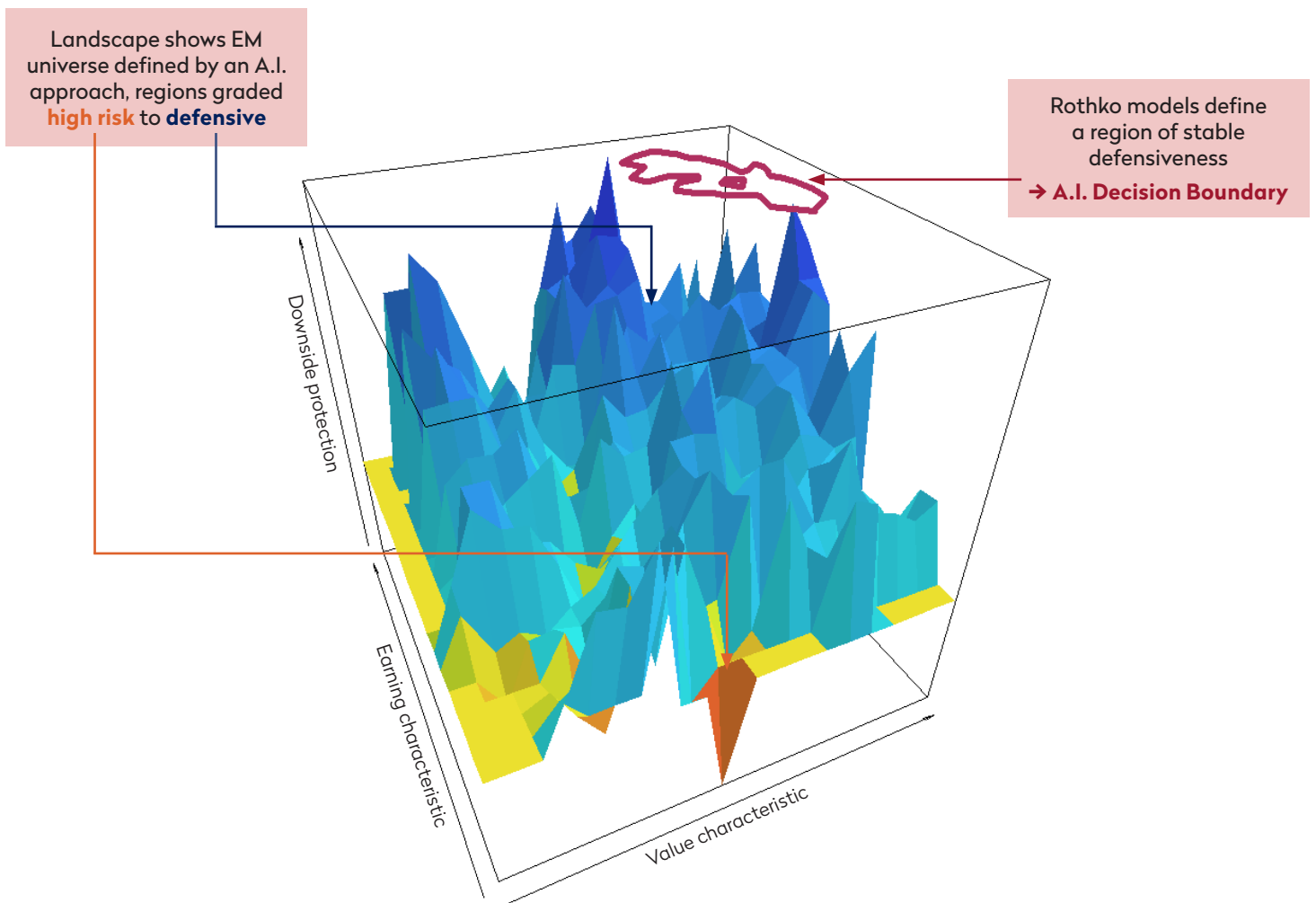
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Artificial Intelligence Through 'Integrated Reasoning'

Rothko's A.I. is driven from 'Integrated Reasoning' which guides our approach to make decisions that are consistent with a successful active manager's stock selection and portfolio construction choices. To achieve this, our models programmatically implement cognitively guided modelling outcomes. The result is intuitive; stocks with compelling valuations, stable or growing revenues, decent earnings growth in US dollar terms and a management team that prioritizes shareholder value. Knowledge extraction within this 'cognitive framework' can be made to be a powerful yet stable force. One example of the deep alpha opportunity this creates is the identification of defensive, value stocks. Exhibit 3 shows the

defensiveness (vertical axis) of the Emerging Markets universe of stocks as a surface, plotted over lower dimensional abstractions of Earnings (Y-axis) and Value characteristics (X-axis). The blue areas represent the most defensive regions of the past 4 years, orange the least defensive. Rothko's A.I. approach has successfully concentrated stock selection in a region of stable defensiveness, known as the Rothko Decision Boundary (red contour in Exhibit 3). While there are many aspects considered by the Rothko models, this is a region generally associated with strong earnings and value characteristics.

Exhibit 3: EM Universe Defensiveness Surface (October 2013 – October 2017) and the Rothko Decision Boundary



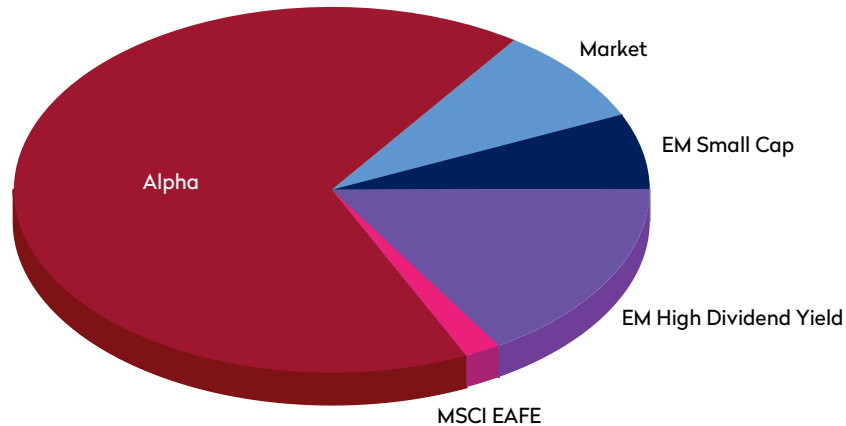
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Deep Alpha – Choose Your Beta Benchmarks

Typical multi-factor alpha (similar to BARRA analysis) should be high for non-linearly driven approaches such as Rothko (See exhibit 4). This would simply reflect that non-linear approaches should not stylize equity returns as a series of straight line relationships with theoretical risk factors. If this holds true, a generalizable, non-linear based strategy should be able to add alpha over and above a client's choice of beta exposures and also smart beta benchmarks.

Exhibit 4: Multi-Factor Alpha (September 2013 – September 2017)



Source: Rothko Investment Strategies, MSCI.

Rothko: Income Oriented, Value Strategy

Rothko's strategy is first and foremost, an income oriented value approach. This approach is implemented using an Artificial Intelligence methodology based on 'Integrated Reasoning' providing a foundation for our quantitative approach. While the framework is complex, the portfolio outcome is not. We take overweight positions to stocks with compelling valuations relative to their strong ability to support growth in future US dollar payments.

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