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Marketing Material

Harnessing the data science revolution

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"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay."

Sherlock Holmes in The Adventure of the Copper Beeches, 1892, by Sir Arthur Conan Doyle.

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The process of collecting and analysing data has undergone a revolution. No longer is it sufficient for active investors to tease investible insights from familiar information like trading figures, market shares and economic updates. A mass of information, from geospatial data to customs records and demographic data, is now available and can be manipulated in ways unheard of 30 years ago. If investors want to stay ahead of the game, they need to channel this deluge and harness its power to generate alpha in new ways.

To do so successfully, we argue, requires an understanding of what data can do for investors, what needs to be done to it to make it useful and who is equipped to do it. Just as important, however, is an understanding of its limitations and why data science alone cannot replace a good portfolio manager. Those who can marry industrial-scale data processing with tried and tested investment expertise will emerge as winners.

The growing importance of data is why at Schroders we have set up the Data Insights Unit. The team was formed in 2014 and has grown to over 20 data scientists, sourced from a variety of backgrounds and industries. Using data science skills, including machine learning, the team builds tools and provides a research service to help Schroders investors to make sense of alternative data and enable them to make better investment decisions.

What data are we talking about?

"Data" means far more than market data or accounting data. It includes large and "alternative" datasets that may be poorly configured for financial market analysis. Much of this is often thought of as "Big Data". The dramatic increases in computer processing power, storage capacity and information mean that the amount of data that can potentially be interpreted by an analyst or fund manager is growing at an exponential rate, and in a thoroughly unstructured fashion. At the same time, a cadre of data science professionals is emerging and fashioning the necessary techniques to process this data.

These developments pose disruptive challenges to the investment industry. But they also provide a major opportunity for adaptive, well-structured organisations. The investment management industry is, at heart, a data processing industry: taking in data about companies, industries and economies, processing and analysing it and producing portfolios of investments as a result.

Big Data – where did it come from and how is it handled?

"Big Data" is any dataset too big to analyse with one computer on its own. It is a label that has emerged alongside the rise in open-source technologies for processing and analysing data in parallel across multiple computers.

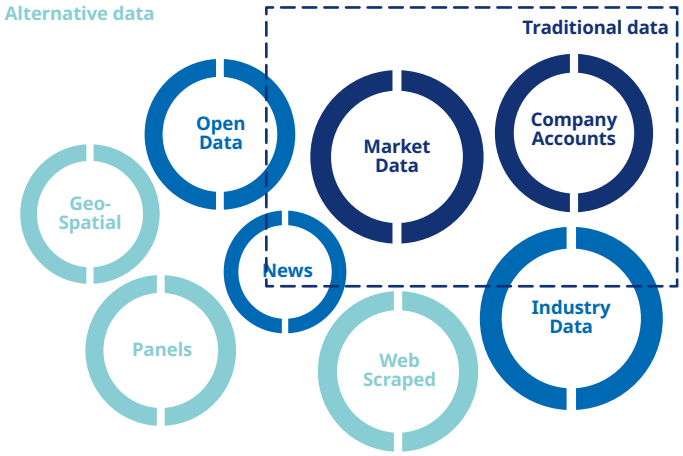
A consequence of these advances is that the computational barrier to working with very large quantities of data has been dramatically lowered. A cluster of one hundred servers in Amazon's cloud can now be hired on demand to process billions of rows of data in a matter of hours. This opens up vast new research capabilities to teams like Schroders' Data Insights Unit, by reducing reliance on conventional corporate databases.

This development has coincided with the realisation that the huge amount of data that accumulates from transactional websites, social networks and mobile devices can, with ingenuity and advanced analytical techniques, answer questions that were not anticipated when the data was originally gathered. Because these datasets were not constructed for such analysis (e.g. the contents of tweets by members of the public), "Big Data" is associated with the idea of unstructured data.

And what is alternative data?

Alternative data is an umbrella term for information that is not already part of the core currency of investment research. This means alternative data is, broadly, everything that is not company accounts, security prices or economic information. The figure below sets out examples of alternative data:

Source of alternative data



Source: Schroders

The multiplicity and complexity of sources of data are important reasons why data scientists are needed in investment management. Traditional market data is organised and is easily accessible to investment professionals. Because alternative data is often unstructured, it may need considerable work before it can yield meaningful conclusions. An example of this is census data, which is created by governments and falls under the category of open data. Although this is in the public domain, it needs a lot of work before it can be used, for example, to generate useful insights on the affluence of a particular area.

Similarly, care needs to be taken in putting together proprietary data, such as the aggregation of individual spending patterns into a broad picture of consumer trends. Such care can, however, be well rewarded. By adopting this aggregation approach, Schroders' Data Insights Unit was able to gain a clear picture of UK consumer spending after the Brexit vote in June 2016. Contrary to conventional wisdom, the analysis revealed that consumer spending had remained resilient, a trend which was only confirmed by official data several months later.

What is a data scientist?

For our purposes, a data scientist applies scientific methods to practical business questions. The raw material for this process is increasingly dominated by (but by no means limited to) the digital data that is the natural by-product of almost any modern business activity. Data lies at the heart of digital businesses such as e-commerce or technology firms.

A classic application of data science is "recommender engines", such as those that suggest products a customer might want to purchase on Amazon or film recommendations on Netflix. The algorithms that power these recommender engines are complex and hard to execute in bulk. Indeed, the amount of data is such that it cannot fit into the memory of a single computer, making it Big Data under our earlier definition.

Modern data and modern methods for its manipulation are clearly very powerful tools in the hands of the investor. But it is also very important to be aware of the limitations of data science. Pressure to produce simple answers can often produce misleading results.

Combining Investment and Data Science

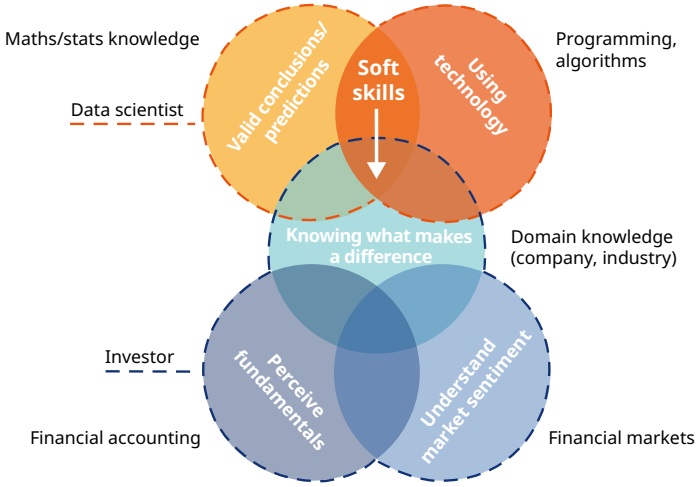
The skills of a good data scientist and a good investor are surprisingly complementary. Good data scientists have several distinct qualities. A good knowledge of maths, statistics, programming and algorithms is essential. But a firm understanding of the business,where the data is from and the way in which it is being applied ("domain knowledge") are equally valuable for understanding what really matters.

The graphic below shows the ideal interaction between different types of expertise to create useful investment conclusions from data. The domain knowledge needed to generate fundamental insights about the security under consideration is essential for investors. Given the nature of the skills and knowledge needed to master investing, this is clearly impossible for any single data scientist to grasp.

Therefore, the best approach is to draw on the investor's knowledge of, for example, a company and its market, harnessing the deep sectoral expertise of our fundamental analysts. By recruiting data scientists with excellent communication skills and intellectual curiosity, they can work closely with the investor to bring together all of the necessary talents.

This is the model that we have implemented in Schroders' Data Insights Unit: combining our investors' deep knowledge of the market and securities with skilled data scientists whose specialised work becomes part of the investment process.

Skills required to integrate data into an investment process

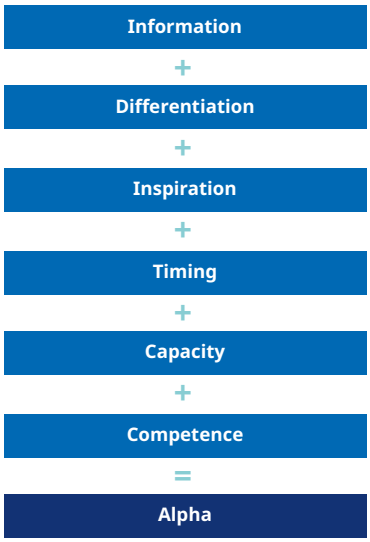


Source: Schroders

Applying data science to investment decisions

An active investment decision is a function of several factors. A fund manager who has excellent information to hand and who is able to form a coherent but differentiated view, drawing inspiration from a broad range of sources at the appropriate time, is likely to generate good performance.

This process can be represented as follows:



Source: Schroders

Data science can play a positive role in each one of these factors.

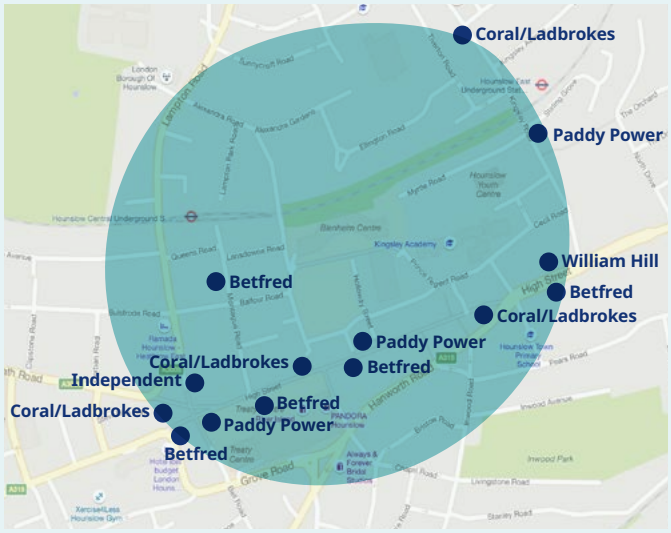
Information

Information is the lifeblood of investing and data science has a huge capacity to extend its range. One powerful way of doing so with the aid of data science is to consider what business information a company would itself use to monitor its success and competitive positioning, and then seek to replicate it. For instance, information about brand perception, customer affluence, location data, even drive-times on road networks, can all be harnessed to provide useful perspectives on the long-term prospects for a given business. Such information can be particularly useful when legislative change affecting a sector is being considered.

Example:

Geo data: rapid answers to complex questions

Location analytics – William Hill and competitors, Isleworth/Hownslow Cluster



Source: Schroders. Map © Bing

In October 2017 the UK government announced its intention to begin a consultation on changing the regulation regarding the maximum stake available on fixed odds betting terminals. Fixed odds betting terminals are electronic machines which contain a variety of games which are normally situated in betting shops.

At the time the maximum stake on a single bet was £100; the consultation would review proposals that it be lowered to either £50 or £2. UK listed gambling companies such as William Hill stated their belief that they would have to close shops if the maximum stake was reduced as it would affect their ability to generate profit at individual stores. William Hill estimated that 70% of their net revenue came from fixed odds betting terminals.

With the results of the UK government consultation due in January 2018, Schroders' UK equities investment team asked for input from the Data Insights Unit. The investment team wanted to discover what the number of shop closures that William Hill would potentially face if the regulation for fixed odds betting terminals was changed to allow a maximum stake of £2.

Using location data for all high street betting shops mapped with demographic data, a geospatial data scientist was able to model different rules sets that would be imposed if there was a change in legislation and determine how many shops would survive relative to the local population. The eventual estimate was the closure of 929 William Hill shops if the £2 maximum stake was imposed.

After the consultation released its recommendation for the maximum stake to be changed to £2, the UK government announced that it would legislate to this effect and the maximum stake on a fixed odds betting terminal would be reduced. Having completed their own analysis, William Hill issued guidance that they would need to close approximately 900 shops.

Differentiation

Effective data science will unearth insights that are unlikely to have been captured by others. The greater the quantity of data that may be relevant to understanding an enterprise, the more combinations and permutations of analysis it becomes possible to conduct. By extension, the likelihood of other parties conducting exactly the same analysis diminishes.

It therefore seems likely that data science at scale within a large investment organisation will generate insight that is differentiated and/or unlikely to be precisely replicated. This becomes more true the longer the time horizon for analysis. For example, the use of large datasets to make predictions for intra-day share price movements is well practised by many hedge funds and therefore there is less scope to provide a differentiated view. However, the use of the same datasets can provide an investment manager with a differentiated, long-term view.

Example:

After the release of a UN report on the theme of Smart Cities, a Schroders fund manager decided to search for companies that might benefit from this theme and increasing urbanisation globally.

Using natural language processing, a machine learning technique, millions of articles were searched in order to cluster those with similar semantic content. From this, it was possible to identify several stories about one key rising player associated with Smart Cities: Silver Spring Networks. The company provided new technology which would be of benefit to large urban centres, such a intelligent street lighting that adjusted to the flow of traffic leading to electricity only being used when needed.

Inspiration

A collateral benefit of applying data science and alternative data to long-term investing is the potential for new ideas to be formed both from the investigation of new datasets and from the insights drawn from data. Datasets from unusual or unexpected sources can act as a catalyst for new ideas or ways of analysing securities. If the results of this analysis are shared with all who may benefit from them, it can lead to further inspiration as to how the data can be used to answer a similar question.

This cycle means the exploitation of such datasets is best conducted centrally by a data science operation, working in collaboration with multiple end users.

Timing

Data scientists can ask helpful questions as well as helping to provide answers. Giving data scientists an explicit mandate to draw attention to patterns in alternative data helps ensure that investors are grappling with issues that are relevant, even when they may not be the focus of general market attention. Such a mechanism seems a better way of directing research than alternatives such as watch-lists of companies (robust but arbitrary), valuation screens (undifferentiated) or a news flow driven focus (relevant but already well covered).

Web scraping is an example of the work of Schroders' Data Insights Unit in this area, where information from a website is extracted in a systematic manner.

This has been successfully used to provide investors with the pricing of products that companies sell on their own and third party websites. The tool provides the investor with real-time insight into pricing and the ability to monitor changes in price, which is particularly pertinent when the cost of raw materials fluctuates or there are other supply chain constraints. As this is updated on a weekly basis, an investor is rapidly able to see if there has been a breakdown in price discipline.

Example:

Internet traffic to a company's website or to a particular page on their website may reveal the popularity of that company or product. However the reverse can be true if the flow of web traffic is due to customer dissatisfaction. When a Schroders fund manager formed the hypothesis that the customer service experience was critical to a particular company's fortunes, Schroders' Data Insights Unit was able to provide analysis into the number of visits to the company's customer services web page and time spent on the page. This analysis proved critical to judging the impact of changes made by the company management to improve customer perception.

Capacity

Perhaps the biggest impact of data science on the active manager is the freeing up of time and intellectual capital. A comparison can be made with the impact of avionics on pilots: the information provided by advanced instrumentation provides for better decision-making and liberates the pilot's mind to do other things that improve overall performance, such as contingency planning. Similarly, an investor who can rely on other specialists to help extend their vision in all the above ways will be that much freer to think and explore fresh sources of long-term alpha. Data science as part of investment management can also act as a form of "intelligence augmentation", filling in blind spots where traditional channels currently fail and increasing capacity for idea generation.

Competence

The tracking of an investor's decision-making processes in a scientific manner has the potential to highlight areas of weakness and improve their underlying ability. It is not only the outcome of decisions that should be tracked (i.e. the accuracy of their judgement), but also the confidence they have in their judgement (i.e. the accuracy of the investor's conviction). Good data science, combined with expertise in behavioural finance, can help shine a light on investor biases and help to optimise conviction. In doing so, it can help investors to know themselves better and improve their performance. The Data Insights Unit has a mandate to help investors discover their areas for improvement by highlighting any behavioural traits and judgements that are hampering performance. By building tools and systems powered by these behavioural insights, fund managers can be given "nudges" that help to ensure they make optimal decisions.

The advantages of scale

A small investment organisation can use the vast quantities of new data available highly effectively and in an agile manner. Conversely, a larger organisation will face its own challenges. However, the data revolution in asset management also confers advantages to larger, well-structured organisations.

Larger teams of data scientists will be able to exploit large volumes of data from diverse sources. The scale and variety of the data available today requires considerable engineering and data management resources if it is to be used optimally.

Certain markets are less efficient at producing information than others – the commercialisation of Chinese data is still in its infancy. Alternative datasets can create opportunities not available to rival investors. An example is direct surveying or mobile phone usage data which sidesteps reliance on traditional channels.

When fully integrated, a data science capability actually turns every investor into a potential data scout. Schroders investors flag new data that they come across for possible wider utilisation by the Data Insights Unit, creating a virtuous circle.

By centralising a data science capability, scale can be achieved that enables the provision of timely and relevant insights, which would be more difficult for a single data science professional to accomplish. A centralised, scaled resource can also share the various pieces of data science work with multiple teams who might benefit from them, allowing the information generated to be fully utilised.

Alpha from data: the long term versus the short term

It is our contention that the proliferation of data generates a competitive advantage for the well-equipped long-term investor. But it is important to note the key difference between long-term and short-term investment horizons when it comes to data science.

A short-term data science approach seeks to establish predictive models based on correlations between certain data and short-term share price performance.

This is an effective but ultimately transient strategy: the more parties establish the correlation, the quicker any inherent alpha will be competed away. And it is highly likely that many other investors will be able to exploit the same correlations, given that one dimension of the analysis – share price performance – is fixed and that the other is a dataset unlikely to be exclusive. The winner in the short-term is therefore likely to be the player who can acquire the most data the fastest, establish the correlations the fastest and trade them the fastest. An obvious area to apply this is in predicting results surprises by anticipating a company's quarterly earnings or revenues by monitoring proxy indicators of its performance such as footfall or card spending. This is no easy feat, but the conditions for victory are at least clear.

This short-term model is in contrast to long-term alpha resulting from deep insight about a company or industry's fundamental prospects. In this latter case, any insight has been derived from a considered examination of sometimes obscure data. If alpha subsequently emerges, it is likely to be because excessive value or growth has been identified, potentially in a unique manner, which will in time be reflected in the share price. It is less likely to emerge because a group of other players has responded to alpha signals from the same data.

To summarise, successful data science in short-term investing is ultimately about speed, whereas successful data science in long-term investing is about knowledge transfer – helping to anticipate the events that will ultimately affect companies, and which will in time drive share prices.

The value of investments and the income from them may go down as well as up and investors may not get back the amounts originally invested.

Conclusion

The proliferation of information available for investment research is a profoundly disruptive force. Data science poses technical and organisational challenges and involves substantial research and development work. But data science also offers a huge opportunity for active fund managers. The injection of new, and potentially unique, methods of data analysis into existing investment processes should enhance long-term alpha generation.

Far from creating a level playing field, where more readily available information simply leads to greater market efficiency, the impact of the information revolution is the opposite: it is creating hard-to-access territories for long-term alpha generation for those few players with the scale and resources to take advantage of it.

There is no easy way to integrate data into models of company or market prospects without hard work. This would be a very different story if the new data merely comprised a proliferation in similar data points, such as results from increased financial disclosure in company accounts: common to all, available to all, understandable by all, and – ultimately – priced-in by all. Instead, the datasets in question here are oblique, and will vary in quality. The more they can be intersected with other datasets, the greater the insight.

Organisations that successfully adapt to this data-heavy world will have a mind-set of innovation and collaboration. They will also be large enough and have sufficient technological prowess to compete.

Those that do evolve, and that remain agile enough to avoid the pitfalls while embracing continuous change, will be in the best position to offer their clients sustainably differentiated returns.

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