

THE DOWNSIDE TO INVESTING WITH ONE HAND BEHIND YOUR BACK – THE QUANTITATIVE – QUALITATIVE DIVIDE

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Abstract: *This paper attempts to provide an answer to the Quantitative versus Qualitative investment methods debate. It starts with a discussion on each method individually and how each method perceives the opposing method. The Qualitative method sees the flaws in the Quantitative method and its inability to include in the analysis valuable qualitative information, in particular Human Capital (HC) practices, which can lead to misleading evaluations such as in the case of the Lehman bankruptcy in 2008. The Quantitative methods, however, are very powerful in their ability to retrieve and analyse data, especially in this era of – Big Data. Data is growing exponentially and only the use of technology and quantitative methods will be able to tap into this information. Yet, it includes only information that can be quantified and it neglects what cannot be quantified, such as HC practices. The paper suggests (1) new approaches to quantify HC and integrate it into the investment process; (2) a new quantitative which synergizes all investment methodologies; and (3) an integrated investment process which combines both Quantitative and Qualitative methods to achieve a holistic picture of equity investments and the estimation of asset values.*

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Introduction

Understanding the change management context for companies globally is the new challenge for managers and for investors. This is particularly important given the continuing risk of ‘hyper-reality’.

Hyper-reality occurs when representations of principal assets such as earnings, quantitative investment models, analyst’s estimates and debt proposals begin to reflect each other and the outcome does not necessarily represent what is actually occurring in the underlying assets.

Financial market players in global equity markets often forget there is a danger in disassociating the stock code from the underlying asset. Behind the pricing models is a real company with real people and human capital and change management practices and systems.

Pricing models which are used by investment market professionals do not typically include this complex interaction. So, investment decision outcomes are often incomplete.

In the context of the global financial crisis, traditional financial analysis models have been shown to be inaccurate. Investors need reliable lead indicators of the potential future value of their investments. While regulators debate how to regulate the financial industry, another important question emerges: is the information to assess corporate performance complete?

At the same time, much investment research is approaching commoditization, with investment managers and the buy and sell-side analysts working on similar data, using similar tools, provided by corporates at similar times.

And yet, there is pressure on investment managers and buy and sell-side analysts to understand “soft” variables in more depth: leadership, governance, management quality and remuneration and systems for managing change, in order to inform and add value to investment decisions.

When qualitative human capital data is used side by side with quantitative analysis, institutional investors have access to more valid and more powerful information on current and potential future financial performance.

“Quantitative Analysis” has a whole spectrum of methods and approaches: from the pure “black box” heavily relied on computer science and machine learning methods to quantitative models based on sound economic theory; from pure mathematical models to statistical models, and; from pure technical analysis to fundamental and economic analysis. Selecting the method depends on the analyst beliefs (and in many cases their knowledge base).

With the current advancements in technology, data feed sources and globalization the need for quantitative analysis to help parse the data in a meaningful way and extract the desired information for investing/trading decisions is increasingly growing. At the same time returns have diminished and Alpha generating strategies have been harder to find, which calls for the demand for innovative investment (and investment analysis) approaches.

Financial markets are too complex to be explained by one research/analysis methodology and all investment philosophies/methodologies have merit – each methodology dissect different aspect of the market and market behaviour and the integrated analysis brings together the full story of market behaviour.

Ben Graham the “father of Value Investing” and the mentor of Warren Buffet (the most famous value investor) – is also considered the first “QUANT Analyst”, even though it was before the era of computers and the internet. His insight on how to analyse numeric information, however, to evaluate and understand the “intrinsic value” of a company is key to the way we use financial statement information to analyse and model companies’ valuation. With today’s computer power quantitative analysts are able to use his methods on a large scale to create “fundamental factor models” for equity portfolio investments.

Charlie Munger, Warren Buffet long-life business partner commented on the best way to approach investing: “You must know the big ideas in the big disciplines and use them routinely – all of them, not just a few. Most people are trained in one model – economics, for example – and try to solve all problems in one way. You know the saying: *‘To the man with a hammer, the world looks like a nail.’ This is a dumb way of handling problems.*” This interdisciplinary approach can be taken a step further to infer that we should not only include different disciplines but also different quantitative methodologies; and not only numeric analysis but also text.

Quantitative analysis (by definition) relates to the way we use numeric information, which is considered “hard” information and in contrast to the Qualitative analysis, which is mostly based

on text and is considered “soft” information. With the advances in computer science it is possible to analyse text – which is referred as “text analytics” and is mostly used to model and predict market sentiment. Text Analytics tries to capture the behaviour of participants in the market. It might not, however, be able to capture all the intricacies of human behaviour and quantitative methods need to be supplemented by fundamental and rigorous qualitative research which takes into account much more broad based change management themes, human capital and special events which factor in the reality of the ebb and flow experienced by firms in changing economic conditions.

Why Supplement Traditional Financial Quantitative Methods with Rigorous Qualitative Research?

One feature of the current system is the “celebrity analyst” and “celebrity investment manager” who develops an individualized, non-documented approach to analysis. When either of them leaves a firm, their insights and methodologies go with them, creating more variation in the overall quality of analysis and investment outcomes (Royal and Althausser, 2003).

Purely financial information and traditional analytical tools have not served investors well. The game is changing from a reliance on traditional models, which focus on “lag” indicators of past financial performance, to a focus on more contemporary qualitative “lead” indicators. But, most traditional analytical approaches do not include systematic analyses of management quality.

In the US, more than half of the shares issued by listed companies are controlled by institutional investors, who are increasingly concerned about all of their investments, and need to see early warning signs of failure or growth prospects.

For commercial bankers, lending proposals are either accepted or rejected on the basis of set financial ratios, such as debt to equity and loan to valuation.

But, do these ratios tell the real story? In fact, is it dangerous for investors to rely on quantitative measures alone? Quantitative analysis, by itself, can underestimate the complexities involved in industry sectors. Properties shared by an industry sector may be superficial, obvious or unimportant.

A famous finance model, the Black-Sholes-Merton (BSM) model, was impressive in its mathematical elegance. Derived by Nobel Prize winning economists, it was used extensively by major financial institutions as they developed finance credit derivatives.

Long Term Capital Management (LTCM) used the BSM model because the partners strongly believed in the power of computing and mathematics to uncover global trading opportunities. For some years they produced extraordinary returns. But, LTCM collapsed when global markets panicked following the Russian financial crisis of 1998. The trading and pricing models had made markets highly interdependent, but the models themselves had not factored in the potential for crises in human behaviour under conditions of unpredictability.

In spite of LTCM’s massive losses, Merton defended the “quant” approach, saying that “A lot of the problems in structured finance have not been due to too much innovation, but a failure to innovate sufficiently”. We agree that there needs to be more innovation, starting with clearer analysis of the human factor in the investment process, if these kinds of events are to be avoided. Some apparently sophisticated financial models, such as David Li’s Gaussian Cupola function, have created problems.

In statistics, a copula is used to couple the behaviour of two or more variables. Li's model used inadequate historical pricing data, in ways for which it was never intended, creating widespread mispriced assets with devastating consequences for investors and their clients. In creating his formula, Li oversimplified the complexities of issues such as real world default statistics. His model was built on the assumption that: "The only thing that matters is the final correlation number, one clean, simple, all-sufficient figure that sums up everything" (Salmon, 2009). But the model was incomplete, in spite of its seductive mathematics.

Nassim Nicholas Taleb (2007), hedge fund manager and author of *The Black Swan*, has criticized this specific model, and the assumptions which underlie similar analytical approaches. He notes: "People got very excited about the Gaussian Copula because of its mathematical elegance, but the thing never worked...Co-association between securities is not measurable using correlation." Historical data alone cannot prepare investors for that one day when everything works against them.

Peter Wilmott, a quantitative finance academic and consultant indicates that the relationship between two assets can never be captured by a single scalar quantity.

For instance, consider the share prices of two sneaker manufacturers. When the market for sneakers is growing, both companies do well and the correlation between them is high. But when one company gets a lot of celebrity endorsements and starts stealing market share from the other, the stock prices diverge and the correlation between them turns negative.

And when a nation morphs into a land of flip-flop wearing couch potatoes, both companies decline and the correlation becomes positive again. It's impossible to sum up such history in one correlation number" (Salmon, 2009).

Overly simplistic pricing and trading models fail to incorporate the complexities which underlie the listed firms which are the basis of these investments. It is not possible to sum up human capital dynamics within firms, or in the broader market, with one correlation number.

As David Li said of his Gaussian Copula formula: "*The most dangerous part is when people believe everything coming out of it.*"

But, in the finance industry, where "quant analysts" command enormous prestige, it is not surprising that some institutional investors see only the numbers, and become disconnected from the complex reality the figures are supposed to represent. "They think they can model just a few years' worth of data and come up with probabilities for things that may happen only once every 10,000 years. Then people invest on the basis of those probabilities, without stopping to wonder whether the numbers make any sense at all" (Salmon, 2009).

While this investment approach is less than ideal, it is not surprising. Over 90% of financial analysts studied in a case analysis of investment banking in Australia had degrees in quantitative disciplines, such as econometrics, actuarial studies, economics, engineering and accounting (Royal and Althausen, 2003).

But, even world renowned economists now believe that understanding the financial performance of firms requires a much deeper, more robust, understanding of human behaviour than economists previously admitted (Akerlof and Shiller, 2009). Firms like Google recognise this and use qualitative human capital indicators, as well as quantitative models, as a component of the business communication cycle.

Quantitative methods, developed by finance academics, need to be supplemented by fundamental and rigorous **qualitative** research which takes into account much more broad based

change management themes, human capital and special events which factor in the reality of the ebb and flow experienced by firms in changing economic conditions.

Definition of “Human Capital”

In this context, we define human capital as the systems by which people are managed, and therefore, human capital becomes observable and comparable, across industry sectors and across time. The term ‘human capital’ is distinguishable from the more commonly used term ‘social capital’ which is defined by Dunphy, Benveniste, Griffiths and Sutton (2000:6) as human sustainability, which implies building human capability and skills for sustainable high level organisational performance, and for community and societal well-being. (Royal and O’Donnell’s 2008) definition of human capital as management systems assumes that human capital is manifested in a firm’s unique configuration of observable human capital systems such as: training and development, performance management, knowledge management, career planning and succession planning. Human capital is broader than employee engagement, and incorporates management systems (Royal and O’Donnell, 2008).

This definition, consistent with Werbach, (2009), Raisch et al (2009), Raisch and Birkinshaw (2008) assumes that human capital is manifested in a firm’s unique configuration of human capital systems such as: training and development, performance management, knowledge management, career planning and succession planning. HR management systems are difficult to replicate, to implement and to change, and it is argued that firms which have superior HR management systems also have a potential long-term source of competitive advantage (Becker, Huselid and Ulrich, 2001. Bassi and McMurrer, 2007).

Human Capital Impacts Financial Performance

Human capital does have an impact on future financial performance. Watson Wyatt compared 1999 HCI (Human Capital Index) scores and 2001 financial results and also 1999 financial results and 2001 HCI scores in an attempt to determine which direction the link between the two ran.

The result was a much larger positive correlation between 1999 HCI scores and 2001 financial results, indicating that it is more likely that superior HR practices will improve financial results than financial results will lead to improved HR practices.

Institutional investors look at intangible sources of value. Bassi et al (2001, 2007) surveyed 275 active US institutional investors on their basis for investment and found that 35% of decision making, in a sophisticated simulation, was based on non-financial data, of which half was specifically human capital related. They also found that 60% estimated that 20-50% of investment decisions are driven by non-financial data. So, while investors try to assess “quality of management”, they don’t have the tools by which to analyse non-financial value in a systematic way.

Some of the of the human capital analytical tools available in the past have focused on applying principles from accounting and finance to human resources. These have included attempts to value people as assets (by applying accounting valuation principles); creating an index of ‘good’ management practices and relating these to business results; statistics about the

composition of the workforce and measures of the productivity and output of people (Mayo, 2001).

But none of these approaches analyse the fundamental **drivers** of human capital in ways which can be readily understood by investors. Investors need to be able to assess whether a firm can deliver on its stated strategy, and to understand whether management systems are internally consistent and consistent with strategy. “Long only” fund managers, in particular, say that their job is to back management teams, but they lack the necessary analytical tools assess management teams in a systematic way.

This is important in knowledge intensive firms where intangible value is a large proportion of firm value. Institutional investors need to be able to value intangibles like intellectual capital (which can be seen to some extent in patents and royalties) but also they need to be able to assess the quality of the underlying human capital and change management which drive the innovation which underpins the intellectual capital.

Many human capital models fall into the trap of measuring what they *can* measure rather than what they *should* measure. For instance, measuring knowledge in an organisation is more than numbers of hours in training sessions, or number of patents held. It is possible to create knowledge capital indices, but knowledge capital can only exist in the context of management systems. Initiatives like the United Nations Principles for Responsible Investment provide incentives to broaden equity research to incorporate themes from good governance principles and strong environmental management.

The “first wave” of Environment-Social-Governance (ESG) investment, prior to UNPRI, was launched by selected large European institutional investors in November of 2004. The aim of the Enhanced Analytical Initiative (EAI) was to encourage sell-side analysts to systematically examine intangibles by allocating five percent of their broker commissions for superior intangibles research (Bauer, Haerden et. al., 2004). This initiative, now a component of UNPRI, was an implicit acknowledgement of a knowledge gap in securities analysis to distinguish material non-financial data. Social or “S” ESG themes are less standardized, and vary from themes as diverse as labour law compliance, health and injury statistics, community engagement (such as in the London Group Benchmarking Model), social business investment to philanthropy, and trade-offs between ecological and social themes (Angus-Leppan, Benn and Young, 2010).

UNPRI and ESG ensure that listed companies are increasingly judged on their quality of management, so human capital analysis is becoming increasingly more strategic to CEOs, Boards and institutional investors. However, institutional investors need to move through the previous generations of SRI investing to optimize the insights from a new and most powerful approach to SRI investing, which incorporates human capital analysis. In this way, institutional investors are more likely to be able to analyse and interpret elements of human capital risk, which is a significant issue discussed later in this paper by way of a company example. But, so far, these initiatives have fallen short on focusing on the underlying human capital drivers of value.

The importance of Qualitative Processes - Human Capital Systems and Risk at Lehman Brothers 2008

To illustrate the challenge that institutional investors face with regards to formally and systematically predicting the future performance of a firm and indeed events that lead to financial failure, it is worth noting that the same day that Lehman Brothers investment bank filed for bankruptcy on September 15, 2008, in New York, the three top credit ratings agencies had

rated the firm as above average in its ability to meet its financial commitments. Not all quantified quantities can be identified through a mathematical process as highlighted in the discussion above with regards to quantitative strategies and the investment process. Furthermore, a superficial analysis of selected “S” indicators from an ESG perspective would indicate that the bank was doing well financially. For instance, at the 2008 ALB China Law Awards, Lehman Brothers was crowned Debt Market Deal of the Year and Equity Market Deal of the Year. In 2006, Dick Fuld, the CEO, was named #1 CEO in the Brokers & Asset Managers category, by *Institutional Investor* magazine. In 2007, Dick Fuld received a \$22 million bonus. In 2007, Lehman's net profit had risen 5 percent to a record \$4.2 billion. In June 2008, rival CEOs, including Lazard's Bruce Wasserstein, stated their confidence in Fuld as CEO.

While this qualitative “S” information is necessary, it is not complete, as became evident later that year. “The day that Lehman filed for bankruptcy, September 15, 2008: S&P rated the investment bank's debt as A – a ‘strong’ capacity to meet financial commitments, (Swedberg, 2009). Moody's had rated Lehman A2 -‘low credit risk’. Fitch rated Lehman A+ or ‘high credit quality’ ” (Evans and Salas 2009). Those analysts who had tried highlight the negative aspects of the corporate culture, including the performance management and remuneration systems, were criticised (Swedberg, 2009).

With the benefit of hindsight and documents which became publicly available after the Lehman bankruptcy, US House committee Chairman Henry Waxman said Lehman documents portray a company in which there was “no accountability for failure“. CEO Dick Fuld ran Lehman in an authoritarian manner, creating the competitive corporate culture characteristic of investment banks. Anyone who was perceived as a threat by Fuld was eliminated, and so were critics who argued that Lehman was “heading for trouble” (McDonald 2009). Fuld's personal experience was as a bond trader , he had little detailed experience of financial instruments such as collateralized debt obligations and credit default swaps (McDonald and Robinson 2009:91, 234-36). Lehman's last CFO was a lawyer, without qualifications in Finance or Accounting. Hedge Fund Greenlight Capital's president, David Einhorn, highlighted some of these human capital themes in October 2007, March 2008 and May 2008, but was criticized by journalists in the business press for being inexperienced, arguing his analysis was “underdone”. Whistleblower Matthew Lee, a former senior vice president, Finance Division, in charge of global balance sheet and legal entity accounting, was sacked in late June 2008. In May 2008, Lee had written a detailed letter to Lehman's top managers about \$50 billion Repo 105 transactions in Q2, 2008 (Wall Street Journal, 2010). *The Street* website stated that Dick Fuld "*ruled with an iron fist, and ultimately his poor leadership and management led to one of the largest bankruptcy filings in history, noting that “A single man's leadership style resulted in the financial ruin of tens of thousands of employees and shareholders.”* Lehman's bankruptcy was many times the size of Enron.

This indicates that institutional investors may not have learned enough about the strategic role of human capital analysis as a lead indicator of future financial performance since Enron declared bankruptcy a decade ago and human capital was not a theme in ESG reports and/or other investment reports over the period or a part of any quant strategy with regards to investment. Waddock (2002) noted that Enron won a spot for three years on the list of the best companies to work for in America. In 2000, it received six environmental awards. It issued a triple bottom-line report. It had policies on climate change, human rights and anti-corruption. The CEO was a guest speaker at ethics conferences. Most importantly, however, is that Enron

featured in many social investment funds before it collapsed. However, a human capital perspective on Enron could have revealed a culture of human capital systems, including performance management systems, remuneration and career planning, which were internally inconsistent and inconsistent with the strategy of the organisation. A human capital analysis of these systemic inconsistencies can highlight questions of sustainability, in its broadest sense, that is, “Can this organisation survive?”

By examining any inconsistencies between human capital systems, such as remuneration and performance management systems, a human capital analysis can raise questions about the sustainability and internal consistency of such practices. In the case of Lehman Brothers, the inconsistencies between rewards, remuneration and performance management systems and have been implicated in the downfall of the firm. Quant Strategies and Quant Funds either ignored the human capital qualitative data or grappled with it in a superficial way and the common “S” themes in ESG investing overlooked the complexities and investment risks at Lehman’s. It is Qualitative human capital insights that need to be systematically embedded in the investment analysis and recommendations of institutional investors. Without a full analysis of human capital data in the investment process sitting alongside fundamental and/or quant strategies risk let alone decisions about the future financial performance of an investment can be poorly analysed, leading to devastating consequences.

What do Quantitative Fund/ Quantitative Investment Strategy mean?

To someone who is not familiar with the jargon of the financial industry “quant fund” or “quant strategy” means any study or strategy that is based in quantitative data. This fits the general explanation of “quantitative analysis” explained by “Investopedia” – *“In broad terms, quantitative analysis is simply a way of measuring things. Examples of quantitative analysis include everything from simple financial ratios such as earning per share to something as complicated as discounted cash flow or option pricing”*. In this context it would include Chartists (“technical” analysis), Macro analysis and also “Value Investing” funds, who in general do not consider themselves as “quants” but rather the non-quant alternative to investing.

For a financial professional, however, these definitions are much narrower and encompass only the most sophisticated, technically advanced funds. Their investing models are computer-based, data-intensive using mathematical and statistical methods. In a pure “quant shop” the investment decisions are determined by the (computerized) models rather than by human judgment. There is, however, a middle ground where the fund manager will use human judgment in addition to the quantitative model.

In the space of Equity Investment Management, Fabozzi, Focardi and Jonas (2008) make a distinction which is consistent with the conventional “quant” definition in the financial industry. They make a distinction between “fundamental” (or “traditional”) investment process and “quantitative” investment process. “Fundamental” is an investment process performed by a human asset manager using information and judgment; “Quantitative” is an investment process where the value-added decisions are primarily based on quantitative outputs generated by computer-driven models following fixed rules. The term “fundamental” might be confusing – (1) not all human investment processes are based on fundamentals (e.g., technical analysis based on charts and price movement); (2) the majority of quantitative models are tilted towards fundamental factors. The best distinction might be – “judgmental” versus “automated”, however, “fundamental” and “quantitative” are the commonly used terms in the industry.

Is the Quantitative process fully automated? The answer would probably depend on the investment horizon. Algorithmic Trading is most likely fully automated and in particular “high frequency trading” and “electronic market making”. The shorter is the holding period (down to the millisecond in high-frequency trading) the more likely the process to be fully automated. No human judgment can intervene when the transaction is every minute or second or millisecond. An automated process driven by computerized algorithms is better suited for this type of transactions. The only human judgment in this case would be – (1) when programming the algorithm and testing its validity, and; (2) when deciding to execute the algorithm. This may not be the case for quantitative investment management. A model driven investment management process consists of: (1) the input system; (2) the forecasting engine, and; (3) the portfolio construction engine. Human judgment can be applied in any or all of these parts. In most cases the process is model-driven with minimal oversight which serves as a control function (i.e., “sanity check” – do the numbers make sense?) When it comes to latest news and rumours about a company, some may use discretion and oversight and some may use news scanning and flagging via propriety software.

Fundamental versus Quantitative Process

The fundamental approach is likely to produce more alpha but brings more volatility. Reducing volatility is when the discipline of quant process comes in. The Quantitative process might bring tighter risk control and better overall performance. A study by Casey, Quirk and Associates (2005) tracked the performance of quantitative funds in the US large-capitalization sector, with a universe of 32 quant managers and 70 products and total assets of \$157 billion and 387 “other managers” (i.e., non-quant, most likely fundamental managers) managing 688 products with total assets of \$925 billion. The study found that for the 2002-2004 period quantitative-driven processes did indeed deliver better performance with tighter risk control. There was clear evidence that quant managers outperformed fundamental managers when the type of returns was taken into account. The most compelling finding was that quant managers outperformed fundamental managers with half the risk – quant managers as a group are better at quantifying the all-around risks and what is likely to go wrong.

Other evidence that relates to quant versus fundamental managers (during the period before the financial crisis), discussed in Fabozzi et. al. (2008):

- In general quantitative processes give an edge whenever a complex problem needs to be solved. Quant has an advantage when there is an element of financial engineering. The investment process is the same, but quant adds value when it comes to pricing components and coming up with products such as 130-30.
- Quantitative processes are more profitable than those run fundamentally.
- If one is a small player, it is probably better to be fundamental, but with a quant process, above a certain size, there are huge scale benefits. If a firm is large enough, the quant process is vastly more profitable. This profitability comes from: (1) a quant process can be scaled to different universes all run by the same team; and (2) a quant process allows more strategies about when and how to trade.
- Quants are ahead in terms of transaction cost analysis and market impact. This is a significant advantage. Quantitative firms evaluate the opportunity of a trade

versus the projected minimal cost of the transaction, and make the trade only if profit exceeds costs.

➤ In general, because quant funds are broadly diversified, returns are watered down. Thus, quant fund do not hit the ball out of the park but they deliver stable performance.

➤ Quantitative firms have a problem in differentiating different financial product – how would they perform in the market when performance includes risk. To “market” this fund on this basis requires: (1) that the investment process and the underlying assumptions be disclosed; (2) that the investor have the ability to understand how a quantitative product will behave. The latter point is the most crucial one. Quantitative products are much more complex and more difficult to explain. This has been the main reason why institutional investors (i.e., pension funds, endowments) shy away from quantitative funds. It is more difficult for quantitative products to pass the hurdle of approval by the board of most institutional investor funds.

How Did Quants Do During The Financial Crisis?

Fabozzi, Focardi and Jonas (2008) discuss the market turmoil of summer of 2007 and the significant losses that quant funds incurred during this period. The main problem was that quants had a lot of positions that were in common with people who had to liquidate positions in summer of 2007. A lot of leveraged managers needed to unwind things for which there was no market, to answer margin calls as banks got scared due to the subprime crisis. Quant managers all had similar positions, although they were massively diversified. The problem was one of statistical arbitrage strategies; there was too much money in short positions in a specific period of time. Hence, the similarity in strategies and in factors led to liquidity problems and was detrimental to most quant funds, and as a consequence was also detrimental to the market as a whole.

Another problem was the heavy shift in correlation at that period, which most certainly impacted the quantitative process. The increase in correlation meant a reduction of diversification and poor performance in hedging strategies. Khandani and Lo (2007) concluded that increase in correlation over the 1998-2007 period made markets more global and more prone to contagion. The difference between the Long-Term-Capital-Management problem of 1998 and the financial crisis of 2007 is that the problem of 1998 was contained in a few firms where as in 2007 the credit problem spread to the equity markets. The problem with the financial crisis of 2007-2009 is that it hit all markets – not only all asset classes but also all markets globally.

During the financial crisis and a short period right after, quant funds endured very bad publicity and investors shied away from them. But since the recovery of the market (which is going strong for more than five years), quant funds not only managed to recover but also to increase their assets under management significantly – from about \$88 billion in 2003 to \$400 billion in June of 2014. There are increasingly more quant funds than in 2003 – the growth in number of quant funds is mainly in algorithmic funds, a block-box model with very short-lived discoveries, down to the millisecond.

Using the same distinction as Fabozzi, Focardi and Jonas (2008) between quant and fundamental funds, Chinacrini (2010) shows a different perspective on how quant funds performed during the financial crisis. He defined fundamental funds as “qualitative” funds – any funds that use a discretionary process rather than a systematic one was classified as “qualitative” fund. Looking closely at the classification in Chinacrini (2010), however, it is similar to the

definition of the “fundamental” fund defined by Fabozzi et. al (2008). With 20 years’ worth of data (January 1994 to March 2009) he concluded that overall quant funds as a group perform better than “qualitative“ funds, especially when considering all risk factors. This conclusion remained true even when he partitioned his sample to examine how quant funds performed specifically during the period of the financial crisis.

What Can a Quantitative Process Quantify?

Everything related to accounting at the company level, balance sheet and income statement, and even accounting at the national level, by nature is quantitative. Thus, in a narrow sense finance has always been quantitative. The novelty is that we are now quantifying things that are not directly observable, such as risk or things that are not quantitative per se, such as market sentiment.

A quantitative process is an empirical process. What is being quantified, however, is not necessarily directly observed. Quantifying, therefore, is more than a question of establishing a process of measurement. It is the definition of a theoretical term that can be put into relationship with other observations. The interest in quantifying things is not because we are looking for a “precise” number to an event but rather because these “estimated” quantities will allow us to predict (to a certain degree) other observations. Modellers in finance quantify quantities and vaguely defined concepts for the purpose of making a forecast. They are using these quantities – whether observed or not – as they believe that with these quantities (which are not “precise”) they can construct a useful forecasting model.

To estimate “hidden” quantities – quantities that cannot be observed but rather inferred by the model – Financial Modellers use a procedure known as Financial Econometrics. For example, volatility is a hidden term. Econometric models such as, Autoregressive Conditional Heteroscedastic (ARCH) or the Generalized Autoregressive Conditional Heteroscedastic (GARCH) or Stochastic Volatility models, all are ways to model the hidden (but very important for financial markets) volatility term.

Not all quantified quantities can be identified through a mathematical process. Market sentiment, for example, is such a quantity. One simple way, for example, to do that is to take analysts’ recommendations – a judgmental information – and convert it to quantitative information such as percentage of analysts issuing a sell versus a buy recommendation. A more sophisticated way, for example, is to model the signals of fundamental analysts – correlated versus uncorrelated.

Another example is the discipline of behavioural finance, which is based on the ability to construct working theories and/or models from data that express human behaviour and its associated biases. In this discipline one needs to measure the psychological state that leads to cognitive biases, such as overconfidence and belief persistence. A simple approach would be, for example, to use technical indicators such as momentum and reversals. A more sophisticated approach, for example, would be to model corporate behaviour in relation to the companies’ financial statements. With the advances in computer science, it is possible today to use text analysis – a quant manager can develop behavioural strategies based on news and social media analytics.

With more participants in the market, it is not enough anymore to base your analysis and models on the databases that everyone else uses. To create an analytical edge you need an

information edge. In this regards simply using financial statements (e.g., balance sheet, income statement, etc.) will not suffice. In order to achieve your information edge you need to dig into the footnotes, find discrepancies in the statements, interpret the information to an event such as – is there prospects of a merger? Is the company in a financial difficulty that is not evident from its financial statement? etc.

If everyone is using the same database and the same models then that could be very toxic to markets. The market events of July-August 2007 made it clear that many quant firms were using the same factors or predictors. This state of affairs is hardly surprising in light of the fact that factor models are one of the most intensively researched subjects in financial modelling and their use is widespread. Since linear factors are relatively easily determined, the same factors will tend to be used by a lot of quant managers to estimate profits. Therefore, unexploited profit opportunities would probably be found in the nonlinearities of the market. Nonlinear models are more difficult to model and that's the challenge.

How can Fund Managers – Fundamental and Quant – Have Better Control on Investment Risk and Gain an Edge?

There are two main practices to approach this question: (1) using the same data but in a different way: using it differently either by different models or different methods (i.e., techniques) or different methodology; (2) trying to tap into new sources of data.

Using the Same Data But in a Different Way

The emphasis could be on building “better” models, in an attempt that the new models will be able to extract information from the data in a different way. It could be that the model will be able to capture the nonlinearities of the data, or will be able to model the distribution of returns in a more “accurate” way. Many of the fundamental theories in finance (e.g., CAPM, Black-Scholes, Sharpe Ratio, etc.) relay on assumptions that do not necessarily represent the “true” distributions and events which they try to model – using inaccurate model leads to inaccurate predictions and therefore poor performance. New models have been suggested – more sophisticated, more complex. Complexity of a model, however, makes it quite difficult to implement and adjust its performance attributions when necessary. Financial markets are complex and the simple models may explain the market conceptually but will not be able to capture all the intricacies of the markets.

One can also use more machine based – machine learning and other artificial intelligence techniques. The idea is to discover patterns in the data that can then be used for predictions. The crucial aspect of these techniques in finding an algorithm is – to separate information from noise. The general methodology for performing this separation is to constrain the complexity of the algorithm so that it captures the important features, not the noise. The concept of Information Theory may be used to assess the amount of information that can be extracted from the data. Unfortunately, methodologies to separate noise work well only if there is not much noise and if the sample is very large. In most financial applications, however, neither condition hold. Data mining applications to finance need support of theory to guide the search. For most financial markets/instruments that does not exist with the exception of derivatives.

The above two approaches even though take a different direction in modelling and analysing the data, they suffer from acute drawbacks. In the context of “using the same data”, we suggest, a third approach – synergizing all investment methodologies.

Investment managers are classified by the methodology they use for investment decisions and their funds are also classified by these methodologies. The main classification groups are: fundamental, economic/macroeconomic, technical and quant. Fundamental (mostly “Value Investing”) primarily focuses on a list of “best ideas”; Economic (i.e., Macroeconomic analysis) focuses on cyclicalities in the economy and markets; Market (i.e., Technical analysis) focuses on charting the movement of prices and predicting the future trend; Quantitative, usually associated with a “crunching numbers black box”, its usability and effectiveness, however, is much wider and comprehensive.

Each and every one of these methodologies has merit and each uses the data in a different way and therefore may extract and focus on different aspect of the markets. Financial markets, however, are very complex, and unlike velocity or temperature or DNA do not have a repeatable, replicable pattern that can be measured and predicted with almost certainty. Financial markets can be unexpected, unpredictable and changing constantly, because unlike hard science the human element is rooted in their behaviour; and human behaviour can be bewildering at times.

There is no right way or wrong way to look at the market and no “exact” or “correct” process exists. Each methodology dissects different aspect of the market and market behaviour and the integrated analysis brings together the full story of market behaviour. By combining market, economic and fundamental data and using quantitative techniques this new methodology can be applied to the benefit of investors, traders or policy makers in their decisions making process – be it an investment strategy; a trading strategy, or; market policy.

The importance of such a methodology could be illustrated as follows. Suppose for example that the market is exhibiting a spike in volatility. In order to decide if and how to make adjustments to the portfolio, a portfolio manager needs to understand the source of this risk and whether it is fundamental or technical. If the source was an economic event then the question becomes whether it’s a temporary panic in the market on a situation that is about to be resolved (as was the case in early 2010 when concerns about the European debt intensified, the market volatility spiked and then recovered as the Euro zone started offering solutions for the problem.) It also helps to understand whether the portfolio has a temporary exposure to excessive risk that may need to be mitigated. If it is a fundamental shift in the economy (known in econometrics as a regime shift) then models need to be adjusted and risk and portfolio construction need to be reassessed¹.

Trying to Tap into New Sources of Data

We could increase the certainty of our predictions by tapping into new data which may add information that we did not have before. We are living in an era of great technology and globalization, where new information comes to our attention every second of the day. This is the age of – Big Data.

¹ A system which integrates all methodologies and the data sources associated with them will be able to assess the “exact” causes for a change in the market in an efficient and timely manner. The more efficient is the analysis of the risk the better is the portfolio manager ability to effectively mitigate it.

The problem with most of the data, even though available, is that most of it is Unstructured Data which is typically text heavy. Traditional computer programming is not able to analyse this type of data, for this task you need specialists in Information System and in particular in Unstructured Information Management Architecture (UIMA). Yet, some text data cannot be extracted and analysed via this new technology and therefore left unused. Especially in a quantitative process, only data that can be “quantified” is used. Fundamental process may use text data and extract data manually, but will not necessarily try to tap into new data, mainly because of cost or lack of awareness. The information/data that is “left” unused, however, could be very valuable and should not be ignored. One such “ignored” but valuable information is – Information on Human Capital (HC).

The Role of Human Capital

There is quite a significant literature on the relationship of investment in HC and firm’s performance. For example, Bassi, Lev, Low, McMurrer and Sierfend (2001) and Pfau and Kay (2002) found that organizations with best HC practices provide higher returns to shareholders than companies with weak HC practices; Low and Kalafut (2002) and Hansson, Bo, Ulf Johanson, and Karl-Heinz Leitner. (2003) show the impact of investments in HC on firm’s future financial performance, and; Buckingham and Coffman (1999) find that quality of management was key factor in determining employee retention, customer satisfaction and productivity.

The event of Lehman Brothers in 2008 as described in a previous section above can serve as a good example to the findings of Buckingham and Coffman (1999) and highlights its importance. As discussed in Royal and O’Donnell (2010), it is clear today that the piece that was missing from the analysis and evaluation of Lehman Brothers before its bankruptcy was the information on HC and in particular, as it relates to its management, CEO Dick Fuld, who managed Lehman in a totalitarian manner, where anyone who critiqued him or was perceived as a threat was eliminated. This type of management evidently does not create a corporate environment and culture of engagement and productivity.

Buckingham (2005) explains how good managers create good systems of HC – from hiring the right people to building the right working environment which leads to performance and productivity. In other words, good management establishes good HC practices² in the company. This implies that the key element is – management.

This observation is not surprising. Two well-known value investors, which are also considered among the best investors of all times – Warren Buffett and Carl Icahn – focus on management. Buffett invests in a company with good management. In his 2007 letter to shareholders, he states: "*Charlie [Munger] and I look for companies that have a) a business we understand; b) favourable long-term economics; c) able and trustworthy management; and d) a sensible price tag.*" Carl Icahn, on the other hand, takes the contrarian approach. He looks for companies with poor management. After he purchases a significant position in the company he calls for change of management or the divestiture of assets in order to deliver more value to shareholders³. Carl Icahn was once quoted: "*One of the hidden ‘assets’ in many companies is top*

² Bassi and McMurrer (2007) and Royal and O’Donnell (2010) introduce management practices as a key driver among the HC drivers.

³ The compensation of CEOs is a subject on which Icahn focuses publicly, as he believes that many are grossly overpaid and that their pay has little correlation to stock performance.

management: get rid of them and the value goes up. What's going on in companies these days is absurd. It's like a corporate welfare state. We're supporting managements who produce nothing. No, it's really worse than that. Not only are we paying these drones not to produce, but we're paying them to muck up the works."

If these great investors, with outstanding investment records focus on company's management as a driver of firm's value, then they must be doing something right. The management factor or any driver that relates to HC practices has been estimated qualitatively, yet it has not been integrated in any quantitative model, because this information is both difficult to attain⁴ and to quantify.

The aspect of investment in HC is not addressed by any investment process, except for the purposes of measuring and ranking ESG Index. Part of the "S" in ESG relates to investment in HC, but there is no explicit information available on HC ranking or its contribution to the overall ESG ranking of a company. Furthermore, De and Clayman (2010), when estimating the relationship of each component in the ESG (i.e., "E", "S" and "G") separately with returns, concludes that unlike the "G", the "S" does not have an impact on subsequent returns⁵. This is not surprising, because the "S" as it is measured today is quite problematic: (1) It tries to encompass everything that relates to the social activity of the company not only HC. It also includes Human rights policy, community policy, product responsibility and health and safety policy. Hence, unlike the "G", which focuses mainly on issues related to the Board of directors, the "S" is a much "noisier" measure. It could be that De and Clayman (2010) results are driven by this "noise" (some of the social issues might be relevant to value and some are not, and the overall aggregate of them shows no relationship to future returns.) (2) Unlike the measures of the governance score which are more identifiable and publicly available (as this information is regulated), the "S" is much more difficult to identify and/or attain. Therefore the proxies may not be measuring what they are trying to capture, which leads to a "bias" of omitted variable. The "bias" is created when the model compensates for the missing factor by over- or underestimating the effect of one of the other factors.

From the above discussion it is clear that there is much work to be done on quantifying HC drivers both in terms of investment models and ESG measures. Therefore, one begs the question – what can be done differently?

In the space of Indexing and Ranking, we can suggest a stand-alone HC Index/Ranking. There is not much empirical evidence to show how and if human right policy or community policy relates to firm's value⁶. We do have, however, both from qualitative and quantitative studies evidence that good HC practices lead to increasingly better future financial performance and an increase in a firm's value. Thus, most likely such an Index/Ranking would be of interest

⁴ Bassi, Harrison, Ludwig and McMurrer (2004), explains that most quantitative research on firm level HC practices has been with data from European countries, where researchers have access to better data on firms' investments in HC. These data however, have been unavailable for most researchers in the US. This problem is also present when it comes to information on sustainability – European companies are required to provide a sustainability report to the exchanges, something that is not yet required in the US.

⁵ De and Clayman (2010), do find, however, that Social scores leads to higher subsequent ROE. The measure that is more relevant to valuation is in fact – ROCE. But this relationship of ROCE and social scores has not been investigated yet.

⁶ This might be a relevant topic for future research.

to the investment community. It is also very likely that if we separate investment in HC and rank it separately – then there might be a positive correlation between investment in HC Ranking and the overall ESG Ranking of an organization⁷.

To create the HC Index/Ranking we can use all the information already gathered in relation to HC which is embedded in the “S”. In addition, since Royal and O’Donnell (2010) include in their HC matrix, among other indicators, also remuneration and compensation⁸, we should take these information from the “G” (which in addition to information on Board of director policies also include information on compensation). Putting these two pieces of information together might present a better quantitative measure (or proxy) for HC practices. Taking it a step further, it could be that we should also consider reconstructing the “G” as well, to only include information related to Board of director policies and issues. This is probably a more “accurate” measure of governance, which is more in line with the definition of corporate governance⁹.

Creating a HC index/Rating is one step in attempting to quantify HC, but it is certainly not enough. We should also consider how to quantify HC practices and integrate them in a quantitative investment model. As discussed above, the key factor is management, and good management will establish good HC practices. Therefore we can think of it as a primary and a secondary effect. The primary effect is good management; and the secondary effect is good HC practices (i.e., if we find good HC practices it will imply good management). We can now try to measure either the primary effect or the secondary effect. But, which measure/effect should we focus on? This will depend on data availability and the ability to quantify it.

Measuring the primary effect means focusing on trying to find proxies for quality of management. The available and quantifiable information on management has to do with their compensation and compensation policies. We can create a proxy using this information in relative terms, for example: (1) management compensation and compensation policies relative to the compensation and compensation policies of the company as a whole; (2) firm’s management compensation relative to its industry peers compensation, and; (3) firm’s ratio of management compensation to its performance relative to its industry peers ratio. We might add to that information from news and social media on management engagement with its employees, customers or community¹⁰. Also, Carl Icahn suggests that there is a relationship between good Board of directors and good management¹¹. If that is indeed the case we can add information on corporate governance as part of this measure.

7A 2014 study by McKinsey concludes that most companies fall short in the execution of their sustainability programs. McKinsey’s conclusions overlook, however, what the cause for poor execution might be. One of the findings of the study (which was not emphasised in the study) was that most companies have poor HC practices, which is very likely the reason for their inability to execute their sustainability programs – after all you need your employees to be on board to be able to execute any firm initiative. This hypothesis will be investigated in a follow-up research

8 The information on compensation is attainable and identifiable, as it is required by the SEC.

9 See definition at <http://corpgov.net/library/corporate-governance-defined/>

10 In this day and age of intense social media where every piece of information is immediately routed to Twitter, it might be possible to find information that is also related to management behavior. There are already some algorithms to extract data from Twitter.

11 This point should be investigated further either with an empirical research or with a survey.

Measuring the secondary effect means trying to estimate the quality of the company's HC practices. The information that could be attainable and quantifiable is information on employee turnover, layoffs, out sourcing, salaries and compensation. As discussed we will create proxies in relative terms (i.e., relative to industry peers). Any information on training or career planning is not publicly available, but the proxies that we can measure might suffice. For example, if a company has a high employee turnover (in relation to its peers), then it is quite likely that it does not invest much in training or career planning. We can add to that information from news and social media, such as surveys (that we can often find on the web) about best companies to work for. We might be able to use this type of survey as a benchmark for our proxies.

A different approach to finding quantifiable proxies for HC practices would be to infer this information from Icahn and Buffett investments. Their investment holdings are publicly available information. We could analyse their holdings in an attempt to find quantifiable indicators that may signal quality of management or HC practices and backtest these indicators to investigate if we could use them as proxies.

The role of HC investment is essential to understanding a firm's value and thus instead of neglecting it, we should do our best to quantify and include it in our quantitative models. To find the best quantifiable proxy we may need to apply all the methods suggested above and then cross validate them with case studies which integrate qualitative and quantitative analysis.

Looking at the Whole Picture

From the above discussion it is apparent that: (1) quantitative methods are very powerful in their ability to retrieve and analyse data, especially in this era of – Big Data. Therefore, they should have a place in the investment process and its decision making, alongside qualitative methods (if information cannot be quantified but can be assessed qualitatively), and; (2) good HC practices lead to an increase in the firm's future financial performance and an increase in a firm's value. HC information, however, is difficult to attain and quantify and thus more often than not is being neglected in most investment processes.

There is no right way or wrong way to evaluate an asset or financial markets and no "exact" or "correct" process exists. Although, in finance we tend to use math to represent asset and market values, these are merely approximations of reality and unlike in hard science these mathematical models do not represent an exact formula, with an exact solution, and thus should not be treated as such. Analysts and portfolio managers can only put their best effort to come up with the "best" estimate of an asset value or markets.

Consequently, all information that is available to assess the value of an asset is invaluable, and all investment methods have merit – Quantitative and Qualitative methods; and within the quantitative, all investment methodologies have merit – Fundamental, Macroeconomics, Technical and Quant. Each methodology dissects different aspects of the market and market behaviour and the integrated analysis brings together the full story of market behaviour or asset value. The qualitative method adds information that the quantitative method is not able to capture and assess, and if ignored the investment process might be omitting valuable information, such as the information on HC practices, from its analysis. Using all information (and all investment processes) provides a holistic picture of equity investments and the estimation of asset values.

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