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# **An analytical tool to aid the reflective selection of equity investments**

A project submitted to Middlesex University in partial fulfilment of  
the requirements for the degree of  
Doctor of Professional Studies

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Institute for Work Based Learning  
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## Abstract

### *Purpose*

The problem the allocator of financial capital has to deal with is that asset selection decisions need to be made *today* based on uncertain *future* expectations derived from accounting measurements and estimations produced in the *past* which are vulnerable to error and creative accounting. The research looks at how this problem has been dealt with in the academic and professional literature and develops a new tool leveraging both quantitative methods and the reflective practitioner's experiential intuition.

### *Methodology design*

A qualitative methodology based on real-world case study (Flyvbjerg 2011) and microanalysis (Strauss and Corbin 1998) is used to develop customised reflexive research tools to assess management success in allocating capital, and audit metrics to illuminate techniques used to conceal poor returns.

### *Findings*

Returns which failed to reach market indices or inflation were observed in the UK investment trust sector over the past ten years suggesting their customers' capital lost value in real terms.

Although Modern Portfolio Theory has useful insights, strong form Efficient Market Hypothesis is rejected as is the over-reliance on mathematical models most of which have been developed under non-realistic assumptions.

Monte Carlo simulation was examined and used alongside experiential intuition (Burke and Miller 1999, Dane and Pratt 2007) to generate insights into future risk management priorities and also as a way of optimising portfolio weighting options. The use of Monte Carlo for risk analysis, while not new in the financial services industry, is less common in industry, which in turn served to generate client work and publication of findings during the research.

In carrying out the research, data inquiry limitations and in some cases data, design and formulaic errors were found in the publicly available research databases.

Therefore a customised accounting database was designed with which to carry out the real-world case studies, which in turn exposed usage of modified accounting bases, creative accounting (Griffiths 1992) and concealment of earnings fluctuations in the statement of comprehensive income (Athanasakou *et al* 2011).

### *Conclusions*

A customised accounting research database (CARD) is developed to provide a basis for conducting structured quantitative analysis based on DuPont (Brealey *et al* 2006), Graham (1976) and my own experientially derived metrics. This quantitative analysis is further supported with experiential intuitive unstructured inquiries in such areas as the likelihood of future returns, debt structuring risks, management orientation and so forth. Monte Carlo is used for estimating probable future outcome distributions and in optimising portfolio weighting. To further reduce the risk of incorrect decisions, a capital allocation policy is developed drawing from both the literature review (mainly Hertz 1964, Modigliani and Miller 1958, Buffett 1977 – 2012, Stiglitz 2010) and my own experiences. At each step in the analysis the practitioner has the opportunity to reflect on the data gathered and to formulate questions needed to address the knowledge gaps arising. The findings expose the care needed when analysing corporate financial data due to the vulnerabilities of financial databases to error as well as the vulnerabilities of published financial data to earnings management (Nelson *et al* 2002). The tools developed in the project place particular emphasis on data integrity through the use of both existing and new analytical and triangulation formulae.



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Finally I thank my wife and daughter for their patience and encouragement while I pressed on with what sometimes seemed a never-ending project.

## Chapter 1 – Critical review of current situation

### The problem of financial capital allocation

In the UK financial capital is allocated at multiple levels: Individual households typically allocate small amounts of capital as loans to banks, such as current accounts; and as investments, such as employer-sponsored pension schemes, Individual Savings Accounts, managed funds and so forth. The banks and institutions who receive these small deposits from numerous individuals then invest those aggregate funds into other institutions, debt securities, commercial property, direct equity investments and so on from where it is often re-allocated into other businesses and projects perhaps several times over. Whether at household level, private institutional level or government level the accumulated amounts involved are often significant as we will see in the Chapter 5 case studies. Correspondingly the risks of mis-allocating capital are also significant because loss of capital by institutions can impact upon the various parties and households who entrusted their capital in the first instance.

How then are we to distinguish between successful and unsuccessful capital allocation? Answering that experientially from my DPS4520 and DPS4060 write-ups, unsuccessful capital allocation results in disappointment for business stakeholders which often translates into loss of employment, loss of invested capital, non-payment of debts and so forth. In the extreme case where a business goes bankrupt, and based on my own experiential observations, employees and suppliers who provided services and goods do not get paid as their contracts which were once legally binding become unenforceable against the bankrupt entity. Investors and lenders who entrusted capital in the expectation of generating a return not only do not get that return but sometimes lose their capital as well. We will see examples of this in both the Chapter 2 literature review and the Chapter 5 case studies.

Less severe than bankruptcy, stakeholders can be disappointed in terms of poor returns. How do we dimensionalise good, average or poor returns? The Chapter 2 literature review provides benchmarks ranging from -100% (complete loss of capital) to +29% per annum achieved by Lynch (Jackson 2010). We can also answer this question with data from the UK professional investment community.

## Ten year UK investment trust performance data

By way of a quantitative data experiment I downloaded the performance results of all UK investment trusts for the ten year period from Jan 2002 to Dec 2011 using the research website Trustnet Limited regulated by the Financial Services Authority and whose data is sourced from the London Stock Exchange. A ten year time horizon was selected to reduce distortion arising from the Global Financial Crisis. There were 184 listed investment trusts in the population (this is the population not a sample) and their capital returns, excluding dividends, over the last ten years can be summarised as follows:

- Calculating the average annual return implied by the ten year performance data for each of the 184 investment trusts, those returns ranged from -99% (complete loss of capital) to +21% per annum.
- The average return across all investment trusts was a mere 0.42% per annum, that is less than half of one percent. Furthermore as shown in Figure 1 below, 75% of the investment trusts were unable to achieve more than 5% average annualised returns over the past ten years.
- The best investment trust, Aberdeen Asian Smaller Companies Investment Trust PLC Ord, achieved an average annualised return of 21%.
- These rates of return apply to the capital invested and returned and do not include broker charges on buying and selling nor dividends of around 2-5% per annum. In the Chapter 5 case studies we will analyse TR Property Trust PLC in greater detail where we see it has paid annual dividends yielding 1.4% to 4.2%.

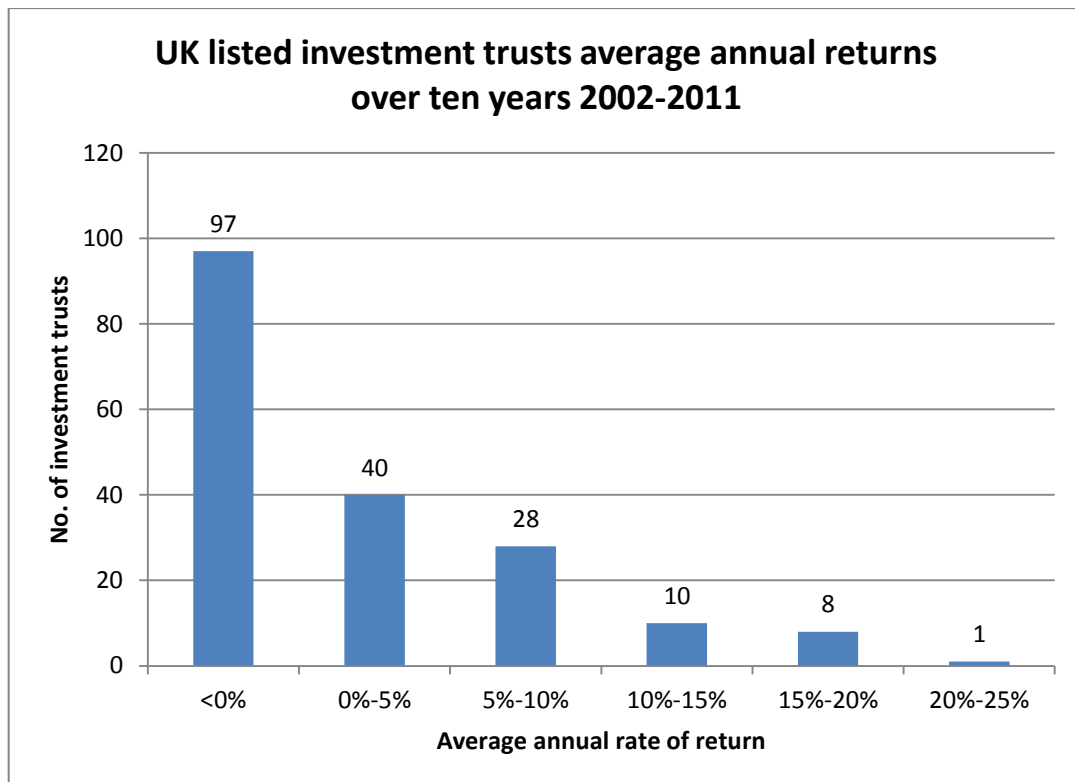


Figure 1 - UK listed investment trust returns 2002-2011

How does this compare to the index? This depends on which index we choose to benchmark against as the UK investment trust sector is widely invested across a variety of global markets. For this purpose it would be reasonable to check against both the UK FTSE All Share Index and the US New York Stock Exchange Composite Dow Jones Index. From the first day of trading in 2002 to the last day of trading in 2011<sup>1</sup>, approximately the same ten year period covered by the Trustnet data above, we get the following results from each of the indices:

- the UK FTSE All Share Index rose  $\frac{(5572-5217)}{5217} = 6.8\%$  for the ten year period which converts to an average annualised return of 0.66%
- the US New York Stock Exchange Composite Dow Jones Index rose  $\frac{(7477-6081)}{6081} = 30.0\%$  for the ten year period which converts to an average annualised return of 2.09%.

The investment trust sector underperformed both indices over the last ten years. What we see here is precisely what Malkiel (2006 edition) had observed in his 1973

<sup>1</sup> Using historic opening and closing index data taken from <http://uk.finance.yahoo.com> on 28 Mar 2012.

book, *A random walk down Wall Street*: that well rewarded professional fund managers, who received bonuses in the good years but not reverse-bonuses in the bad years (Woolley 2010), rarely outperform market indices.

It gets worse. How do the Trustnet returns compare to inflation?

I am reasonably sure those who read this will know from personal experience that inflation from 2002 to 2011 has exceeded 0.42% per annum. But let us see what the data says. According to the Bank of England<sup>2</sup>, inflation has run at approximately 3.1% per annum over that same ten year period.

This experiment shows that not only have professional UK investment trust managers on average failed to match the index, but they have also failed keep up with, let alone exceed, inflation. Only 58 of the 184 investment trusts – that is less than one third of the investment trusts – achieved average annual returns that exceeded inflation. Malkiel (2006) had first observed this phenomenon 40 years ago.

As shown earlier, ultimately the capital allocated by firms is owned by society's individuals. Therefore I would offer a challenge to the reader, given that there is a reasonable likelihood that most Britons will have a financial interest, either directly or indirectly, in the UK investment trust sector whose ten year returns were summarised in Figure 1 and shown to be unfavourable in comparison to the market indices and the best companies in the Chapter 5 case studies:

1. How has your own capital been managed by those to whom you have entrusted it? In answering that question, consider not just your savings, but also your accumulated pension upon which you hope to retire.
2. How transparent is:
  - a. the performance of your capital up to the present time,
  - b. its likely end result, and
  - c. the fees which have been charged by those engaged to manage it?

I consider that a change in practice is needed, starting with my own firm.

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<sup>2</sup> Bank of England inflation calculator viewed at <http://www.bankofengland.co.uk/education/Pages/inflation/calculator/flash/default.aspx> on 28 Mar 2012.

We will refer back to these actual rates of return throughout the Chapter 2 literature review and Chapter 5 case studies.

### **Ethical dilemmas in financial capital allocation**

As will be seen in the capital allocation disasters in Chapter 2 plus my own experiences with businesses that have endured financial difficulty as discussed in my DPS4060 submission, short-termism, self-interest and fear of failure mean that those who allocate capital do not always act in the best interests of their stakeholders. This is the agency problem whereby shareholders entrust their capital to management who benefit from inside information and who may not necessarily act in the shareholders' best interests (Jensen and Meckling 1976).

Anticipating this inherent fiduciary weakness between insider management and outsider shareholders, regulatory and voluntary mechanisms have evolved to ensure at least a minimum degree of accountability from those who manage capital, back to those who provided the capital in the first instance. In the UK these include the Companies Act 2006; regulators such as Companies House and the Financial Services Authority; independent auditors supervised by the Institute of Chartered Accountants in England and Wales; the London Stock Exchange and its listing rules; ethical codes of corporate governance<sup>3</sup> and the like. It is within that financial infrastructure that I have spent my working life to date, which provides useful inside knowledge for the purpose of this project.

Yet business failures have continued despite this ever increasing regulatory framework. In the worst cases when organisations have failed the social costs have included unemployment, knock-on supply chain insolvencies, and loss of capital by shareholders and lenders. As described in DPS5120 I participated in one such case when I was called upon to act as emergency financial controller for a private equity-backed company nose-diving into bankruptcy. Although I managed to save around 100 jobs through working as part of a board team to sell the company to a competitor, a large number of suppliers went unpaid resulting in a great deal of unjust financial

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<sup>3</sup> The UK's corporate governance codes include the Cadbury Report (1992), Ruttman Report (1994), Greenbury Report (1995), Hampel Report (1998), Turnbull Report (1999), Higgs Report (2003). In the US corporate governance is legislated through the 2002 Sarbanes-Oxley Act.

pain for them – many being small family-owned businesses – and a great deal of anxiety for me. In that particular case previous management had allocated capital to expensive premises and hi-tech machinery. Surviving on bank borrowings and free supplier credit, the company's earnings were insufficient to meet its outgoings and after a painful period of failing to meet its obligations it went into administration. It was a small case study in poor capital allocation not untypical of others I have observed or read about.

Not to be overemphasised, the current Global Financial Crisis is another case in point illustrating the causality and ultimate consequences of poor capital allocation (Samuelson and Baobao 2009, Roubini and Mihm 2011). Central to the UK's experience of the Global Financial Crisis have been the partial nationalisations of Lloyds Banking Group PLC and The Royal Bank of Scotland PLC which will be examined in the Chapter 5 case studies. What was known to bankers and lawyers around the risks of sub-prime lending was not necessarily appreciated by credit rating agencies, regulators or auditors – but arguably should have been (Nocera 2009). Society is now suffering in terms of government spending austerity, higher taxation, poor returns on investment as we saw in the Figure 1 Trustnet data, and difficult borrowing conditions for individuals and businesses.

### **My self positionality and ontology**

In framing my ontological perspective I have used Grix (2009 page 179): 'All research necessarily starts from a person's view of the world, which itself is shaped by the experience one brings to the research process'.

Being transparent about my position in relation to the subject of financial capital allocation, I here summarise the key milestones in my intellectual and experiential development with appropriate cross references to the DProf modules completed since 2009. These in turn provide the basis for my ontological perspective, assumptions and biases.

As described in my DPS4520 write-up my interest in the subject began as a teenager when I developed an interest in mathematics. At the time my parents relied on state

welfare. The compounding formula in algebra<sup>4</sup> showed that with careful allocation of financial capital, the poverty trap was escapable with effort and time. So with encouragement from a few mentors, who happened to be accountants at the Christadelphian church to which we belonged, I took advantage of the church's free private education in Biblical interpretation, Hebrew, Greek, history and debate and then a state funded university education in commerce which opened the door to a career in chartered accounting.

Joining Ernst & Young<sup>5</sup> in 1987 as a junior accountant I began by doing client bookkeeping, tax returns, and external audits while studying professional exams with the Institute of Chartered Accountants. I remained with Ernst & Young for some ten years working for them in the UK, Australia and Kuwait and serving a global client base across Europe, the Middle East and the US which provided experience in different national accounting standards and business cultures. After this I joined the corporate sector in a variety of roles including Head of Internal Audit, Head of Risk Management, Corporate Treasurer, Financial Controller and Finance Director.

Throughout this time I wrote 18 reflexive articles across a range of accounting, finance, audit, treasury and computer professional magazines published in UK, US and Australia referenced in Appendix 2.

These experiences and reflexive learnings together with supplementary education in corporate finance at London Business School as referred to in DPS4040 gave me the confidence and background knowledge to start a property investment business, Livingwood, a charitable company Ealing Christadelphian Hall Ltd and a UK consultancy firm, Kelly Partners LLP with Australian branch Kelly & Yang as outlined in DPS5120.

Throughout my 25 year career to date I have worked with dozens of businesses some of whom allocated capital well, and some of whom did not which I explained more fully in DPS4060. It seemed to me that those who performed their duties conscientiously as employees and suppliers went unpaid for their services, while

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<sup>4</sup>  $P_n = P_0(1 + i)^n$  where  $P_0$  is the starting principal,  $P_n$  is the ending principal,  $i$  is the rate of return and  $n$  is the number of compounding periods.

<sup>5</sup> Then known as Ernst & Whinney. The firm merged with Arthur Young in 1989 to become Ernst & Young.



management, whose decisions had brought on the hardship of others, escaped without having to compensate those who had suffered loss. Those experiences impressed upon me the relevance of allocating financial capital and I will draw on several of those examples throughout this DPS5240 project.

### **Epistemic issues**

Having described my ontological context and the inherent ethical considerations I now wish to consider how knowledge is likely to be generated comprehensively and reliably, given the ambiguities, as the next step in developing an effective research methodology.

### **Sources of data and knowledge**

Within the world of business, organisations continually allocate capital provided by investors. Since businesses often operate behind the closed doors of the boardroom, their capital allocation decisions are not readily visible to the researcher. Although financial results are disclosed to tax authorities, that data is not made public. So at the outset it would appear the generation of new knowledge in this context is likely to be challenging.

Fortunately due to the regulatory regimes in place around the world, including in the UK, the financial results of stock exchange listed companies are publicly disclosed as annual and semi-annual financial statements which follow regulated accounting standards. Sometimes extra data or commentary is provided, such as quarterly financial statements and trading updates. Supplementary financial information is also revealed in other ways for instance through the media and even through advertising.

Another factor provides an epistemic advantage to the researcher: the Internet. Whereas in prior decades and even early in my own career, much of the data described in the preceding paragraph could only be obtained by visiting or telephoning individual companies and receiving their annual reports in the post, much of this information is now readily available free of charge via company websites and within minutes of publication.

In epistemic terms, it should be possible for the patient and objective researcher to obtain and convert this abundance of multi-sourced raw qualitative and quantitative data into useful knowledge which can help in identifying the characteristics of successful and unsuccessful capital allocation decisions.

### **Epistemic limitations**

However in converting raw data into useful knowledge I remain mindful of the research risks arising from sources of information that are contaminated by summarisation, biased self-promotion, the possibility of deliberate misinformation, audit failure and my own research biases. Research biases could include the use of selective evidence, blindspots, confirmation bias, inability to see new perspectives, optimism bias and undue emphasis on recent data or events (Kahneman, Lovallo and Sibony 2011). Another limitation when considering capital allocation decisions is epistemic asymmetry (Popper 1959) whereby one disconfirming observation can debunk decades of confirming data. I will examine this further in the Chapter 2 literature review.

In addition none of the data I wish to use in this research is infallible. Some may even be deliberately falsified through fraud or creative accounting (Griffiths 1992, Sherman and Young 2001, Eckersall 2009 and my DPS4060 submission). My two decades' experience as an auditor will help in filtering out data which may have been falsified or exaggerated. To achieve this I make use of unique triangulation metrics as explained in Chapter 4.

Furthermore the databases in which much of this data is held also present epistemic risks in terms of being out of date and having the potential to contain a variety of errors arising from human input, classification inconsistencies and calculation errors. In this way epistemic risks can also originate with the researcher himself.

Therefore the quality of data produced by businesses and databases needs to be categorised into a hierarchy of reliability as well as utility with independently audited data at the top, followed by reliably sourced unaudited data, reliably sourced commentary, unreliably sourced opinion and even advertising. The research tools then need to ensure new errors are not introduced through the research act itself.

## Navigating the epistemic labyrinth

As much as my past training would orient me towards a positivist approach to gaining knowledge, my epistemological position would steer me towards a realistic sense that much of the raw data generated by the business world is unreliable for a variety of reasons, and despite my best efforts I can only hope to move knowledge forwards based on imperfect data. To take advantage of the epistemic opportunities while simultaneously mitigating the epistemic risks, research in the world of business therefore requires:

1. a methodology approach which promotes critical thinking and seeks to eliminate biases (Kahneman *et al* 2011)
2. the exercise of scepticism before placing reliance on source data
3. the analysis of several years of data rather than the one or two years commonly reported by businesses
4. triangulation between accounting, cash flow and qualitative data and
5. a “margin of safety” (Graham 1976) before arriving at conclusions.

I now turn to considering the research questions within the context of these epistemic opportunities and limitations.

## Research questions

Since the aim of this research is to create distinctive and useful knowledge around capital allocation in the private sector, the research questions to be answered are as follows:

1. Through critical literature review and discussion with relevant practitioners determine what techniques are available to capital allocators when making capital allocation decisions with a view to describing a prioritised hierarchy of distinctive capital allocation criteria and/or filters.
2. Through critical data analysis determine which businesses in the corporate sector have been consistently good at capital allocation throughout both good times and periods of crisis and seek examples of businesses which have been poor at capital allocation with the aim of producing a list of case study candidates for further analysis.

3. Using those case studies, analyse relevant historic and recent data in order to delineate incremental insights into capital allocation approaches and capture this in a way that can be used as an ongoing basis for learning.
4. From the above research into relevant literature and case studies, describe how the findings can be used to develop a new model which can be used to improve capital allocation decision-making and translate this into a knowledge based tool or suite of tools for use by my firm in providing value-adding client services.
5. Disseminate a relevant subset of the knowledge gained to the firm's partners and professional associates and into the professional community in order to generate further debate and refinement of capital allocation practices.

In finding answers to the research questions it would be idealistic to expect to find a single formula or theory by which capital allocation decisions can always be optimised. The best I can realistically hope for is to understand current practice and move it forwards in ways which I can describe in both qualitative and quantitative terms.

Having considered the project aims within the context of my personal positionality, I am now able to explore the methodology options which meet the project aims and exploit my past experiences while minimising the epistemic risks.

## Chapter 2 – Literature review

### Theoretical foundations

The literature review needed to consider the underlying theory upon which the doctorate would be developed. The problems with theory include its subservience to interpretational variance among the leading theorists, and theory is also subject to evolve with the passage of time. Therefore I here describe in broad, and hopefully meaningful, terms the theoretical bases underlying this project. Some of the academic theory was engaged with passively while other aspects of theory were engaged with proactively and critically in order to produce outputs that were both theoretically valid and practically useful.

Given the focus of the research questions, Neoclassical Economic Theory of the rationality and independence of individual economic participants each of whom seeks to maximise profits or utility, the setting of variable prices through the cyclical equilibrium of supply and demand, and theoretical validation through mathematical formalisation (Dequech 2008) was the backdrop of most of what follows in the literature review. Aspects of this body of theory turn up in Bernoulli's utility curve (Bernoulli 1738), the efficiency of economic markets (Samuelson 1965, Fama 1970), the mathematical models that occur repeatedly throughout much of the literature and Roubini and Mihm's (2011) economic cycles.

Within neoclassical economics, Modern Portfolio Theory is the dominant theory underlying this project and which I engage with critically. Most of the Modern Portfolio Theory literature takes a positivist mathematical approach to understanding historic cause and effect relationships, such as asset return correlations (Markowitz 1952), beta-designated risk (Sharpe 1964) and alpha-designated excess returns (Estrada 2011), in order to build models to assist economic utility maximisation, such as the Weighted Average Cost of Capital and the Capital Asset Pricing Model. A key underlying assumption of Modern Portfolio Theory is the Efficient Market Hypothesis (Fama 1970, Malkiel 2006) under which markets are assumed to be "efficient" in terms of rationally absorbing known information into prices.

On the other hand Behavioural Finance Theory takes an alternative view of economic behaviour on the grounds that markets are social institutions comprising human beings who do not always behave as rationally as assumed in Neoclassical Economic and Modern Portfolio Theories. In drawing upon Behavioural Finance Theory, I combined my own experiences as an accountant and market participant where I had repeatedly observed ways in which organisational behaviour influences management decision-making. Although it pre-dates Behavioural Finance Theory, Agency Theory was instructive in throwing light on the behavioural challenges between principals and agents where asymmetry of information usually exists (Jensen and Meckling 1976). The Chapter 4 tools development research therefore takes into account the behavioural risks as illuminated by Behavioural Finance Theory and Agency Theory.

Accounting Theory is important to this project's aims as it is the medium by which management (the principals) report back to their shareholders and lenders (the agents). Its theoretical evolution could be said to have been hijacked by regulators who have codified not only accounting principles but also detailed, mechanistic accounting standards in which practitioners such as myself are trained and examined, by which economic participants present their financial results and against which they are independently audited. The main accounting regulations relevant to this project are as follows:

- International Financial Reporting Standards (IFRS). This is an accounting framework for producing and reporting accounting information as issued by the International Accounting Standards Board since 2001.
- UK Generally Accepted Accounting Principles (UKGAAP). Accounting standards as set within the UK. As we see in Chapter 5 most UK listed companies have instead adopted IFRS since 2005.
- US Generally Accepted Accounting Principles (USGAAP) issued by the Financial Accounting Standards Board (FASB). The US is yet to adopt IFRS, so the extent to which Chapter 5 includes US companies those have been analysed within the USGAAP framework with differences to UKGAAP and IFRS highlighted in Appendix 6.

In Chapter 1 I discussed my years of formal study and practical work within this field and how it provides me with a research advantage in being able to decipher accounting data and its underlying assumptions. Accounting Theory continues to develop in the hands of the regulators. At the time of writing, and as evidenced in the case studies of Chapter 5 the UK is advanced in the process of yielding UKGAAP to IFRS (as seen in the British case studies of Chapter 5) while US companies continue to adhere to USGAAP (as seen in the US case studies of Chapter 5). Using my practical experience I have also engaged with Accounting Theory critically especially with regard to the avoidance of volatility through use of the comprehensive income statement, the vulnerability of capitalising rather than expensing costs, the provisioning of future losses under the convention of prudence and the estimations management are permitted to make such as in disclosing segmental results and in intangibles amortisation. My critical engagement with Accounting Theory directly impacts upon the development of the analytical reflexive tools of Chapter 4.

Probability Theory, the historic development of which is outlined in Bernstein (1998), augmented my thinking on risk and how to describe and understand it. The literature review led me to Probability Theory's adoption of Monte Carlo simulation (Bernstein 1998, Suhobokov 2007) and was useful in developing the tools of the later research.

Having considered the underlying theory within the context of the research aims, I sought to combine theory with practice in the literature research cycle as summarised in the following mind-map showing the inter-linkages between asset selection, financing and risk in capital allocation decision-making. The shaded areas of the mind-map are taken from the Institute of Chartered Accountants in Australia and the London-based Association of Corporate Treasurers (ICAA 2012).

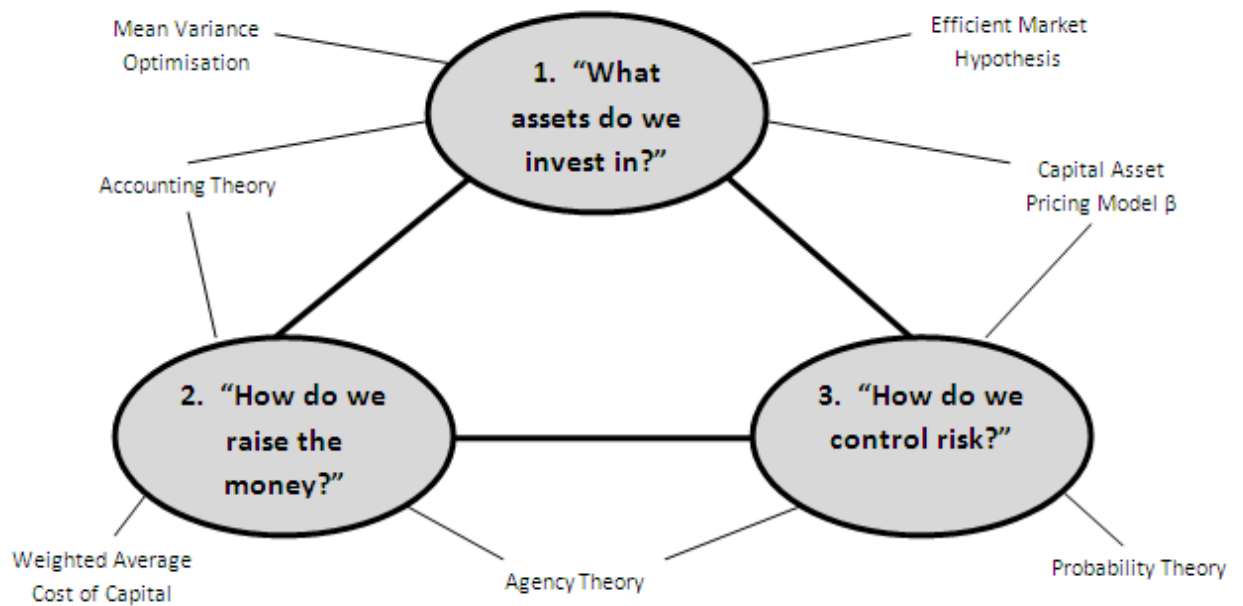


Figure 2 - Illustrative mind-map of underlying theory used to structure the literature review

I structured the literature review around the three thematic thought bubbles from the Figure 2 mind-map.

Firstly in this chapter I review asset allocation literature which I have split up as follows:

1. academic approaches encompassed within Modern Portfolio Theory from Markowitz (1952) to Brealey *et al* (2006)
2. practitioner approaches from DuPont (1920) to Buffett (2012)
3. behavioural finance approaches from DeBondt and Thaler (1985) to Woolley (2010).

Secondly this chapter reviews capital financing literature from Modigliani and Miller (1958) to Miller (1988).

Thirdly this chapter addresses risk literature and events which could lead to loss of capital from Hertz (1964) to the 2009 Madoff fraud.

Clearly there could have been other ways to tackle the literature review, for instance in purely chronological order. Instead the thematic approach adopted here allowed me to build on my undergraduate training and to tell the story of the contradictory ideas between the different writers.



I now turn to the first area of the literature related to how assets are, or should be, allocated.

### **“What assets do we invest in?”: Modern Portfolio Theory**

This part of the literature review includes two early papers which took a mathematical approach to analysing asset allocation decisions. We then turn to the landmark papers on Modern Portfolio Theory in order to understand what it offers to the practitioner.

#### **1613 – Richard Witt – Arithmetical Questions**

Considering its antiquity Witt’s book is pioneering on the peculiarities and practicalities of compound interest, referred to by Witt as “interest upon interest” (Lewin 1970).

Witt presented 124 examples showing the present value of a principal, payments, future value of a principal and so forth at various rates of interest and various compounding periods chiefly annual, semi-annual and quarterly. With the non-existence of calculators, Witt went to the trouble of manually computing a number of tables showing how interest at 5%, 6%, 7%, 8%, 9% and 10% compounds over various time periods. The intended applications of Witt’s book included loans, property purchases and leases. His methods are therefore relevant to both asset allocation and capital financing.

What is noteworthy about Witt is that the financial algebra is fundamentally the same as we use today, the types of transactions are familiar today and the range of interest rates is also in the same range with which we are today familiar.

#### **1738 – Daniel Bernoulli’s analysis of investment propositions**

Bernoulli was a Dutch mathematician specialising in probability and statistics. His paper, ‘Specimen theoriae novae de mensura sortis’, was published in 1738 when Bernoulli was a professor at the University of Basel. The paper used for this literature review was an English translation published in *Econometrica* in 1954. Bernoulli draws our attention to issues around capital allocation including utility, risk and diversification, which resonate in many of the papers subsequently written and reviewed in this chapter.

In this paper Bernoulli looks at the differences in utility between investors. Utility is a way of describing the expected usefulness of a possible gain to a particular investor, which he argues is inversely proportional to the investor's existing wealth, that is  $\frac{\text{expected gain}}{\text{existing wealth}}$  will be smaller for a rich man than for a pauper if the expected gain is the same amount in both cases. Although intuitively one might expect the value of a gain to be equal for all investors, Bernoulli's insight was that this is not the case. Existing wealth must be taken into account, and the utility will not follow a straight line gradient but a logarithmic curve: the concave utility curve used throughout most of the academic literature that follows.

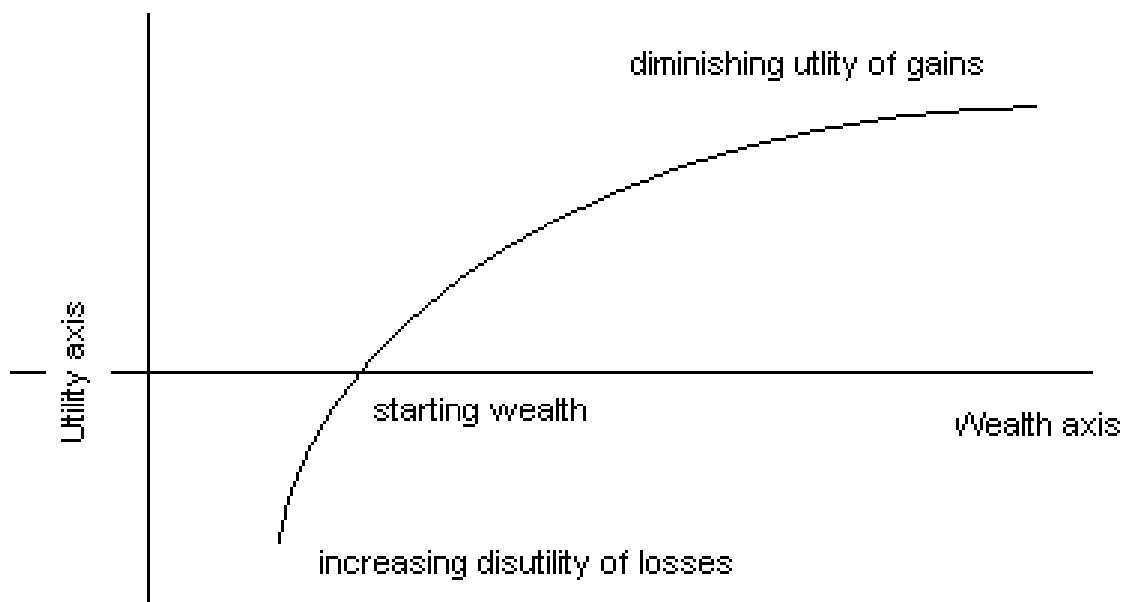


Figure 3 – Bernoulli's utility curve

Bernoulli extended the utility curve to the value of "risky propositions" or in other words investment opportunities. The risk of a potential loss will be inversely proportional to existing wealth. From this Bernoulli was able to calculate a general formula with which to value risky propositions based on the proportion of risk to the investor's current wealth.

Bernoulli started by calculating the arithmetic mean of a likely gain. But as the utility of gains decreases logarithmically, on reflection it became apparent to me that what

Bernoulli had actually derived was a geometric mean of all positive and negative outcomes.

The implication is that gains follow a diminishing utility as they get larger whereas losses follow an exponentially increasing disutility. In fact the trend follows that of a logarithmic curve where we can regard the x intercept ( $x = 1, y = 0$ ) as the investor's current wealth. The investor's wealth is punished more severely for a loss than he is rewarded for a gain of the same amount. The implication is that the rational investor will only enter risky propositions where the chance of gain exceeds the chance of loss which would by definition exclude gambling based on games of chance, even if the odds are fair.

Bernoulli also applied this formula to splitting up his investment decisions whereby an investor's wealth actually increases if he splits up the chance of incurring an expected loss, subject to a diminishing logarithmic curve.

It strikes me as ingenious that Bernoulli's approach automatically takes risk to the investor's starting wealth into account, compared to approaches we encounter later in the academic literature where risk is based on the historic volatility of market prices as described by beta (Sharpe 1964) and is the same for all market participants regardless of their starting capital.

At no point in my past experiences nor corporate finance training has the diminishing effect of gains and the exponential effect of losses on existing wealth been formally considered in business investment decision-making. Yet Bernoulli's paper is relevant both in terms of minimising risk when allocating an amount of capital, and in the value of diversification.

However there are some omissions in Bernoulli's approach. In his discussion of the utility curve, Bernoulli acknowledges it is a generalisation. We will see later in the behavioural finance literature that the standard utility curve may be an oversimplification when trying to understand market behaviour. It is also clear from Bernoulli's examples that he has ignored transaction costs, his examples all involve mutually exclusive propositions and therefore exclude propositions which are related,

and he provides no guidance on how to source and then evaluate the risky propositions. These limitations become a repetitive theme throughout the academic literature and they diminish the practical utility of purely mathematical analyses of capital allocation decisions.

### **1952 – Markowitz’s mean variance optimisation**

Following the advent of early computers, the literature was boosted by new developments in business mathematics such as Bross (1954), Henderson and Schlaifer (1954) and Gaumnitz and Brownlee (1956) addressing increasingly sophisticated mathematical techniques including linear programming to optimise asset allocation choices. One paper of this period stands out as the one to which numerous subsequent papers made reference and which was seen as the birth of Modern Portfolio Theory: Markowitz (1952) in the *Journal of Finance* for which he was awarded the 1990 Nobel Prize in Economic Sciences.

Markowitz developed the idea that a diversified portfolio is statistically preferable to an undiversified portfolio, even if the expected future return of the undiversified portfolio is greatest. He used the statistical concepts of variance and co-variance between securities as a way of calculating the optimal portfolio, namely the maximum expected return for the minimum variance. This was regarded as the efficient frontier; any portfolio with lower expected return or higher variance being inefficient.

Although there seems to be agreement that Markowitz was the founder of Modern Portfolio Theory, his approach has been criticised (for example Sharp 1964, Da Silva *et al* 2009) on the grounds that small changes in expected future returns or individual asset co-variances can have hypersensitive effects on asset weightings particularly if those assets are obscure and therefore considered to have a low correlation with the market. The solution is to impose ad hoc constraints such as individual asset investment limits. That would seem to contradict, or at least admit shortcomings in, the efficient frontier of Markowitz’s argument.

After the considerable mental effort of re-reading and reflecting upon Markowitz’ paper I became suspicious of its heavy reliance on mathematics. The mathematical content of Markowitz’s paper implied a level of precision about what are, after all,

only estimates of future returns. Although Markowitz does not spell it out clearly, probability weightings of future returns are actually the user's subjective estimates, or as Markowitz called them "probability beliefs" (Markowitz 1952). In fact Markowitz admitted as such in his opening paragraph where he specifically excludes consideration of "observation and experience" (page 77); and again at the end of his paper: "This paper does not consider the difficult question of how investors do (or should) form their probability beliefs" (page 81). Where do these beliefs come from? In Markowitz's words: "The judgement of practical men" (page 91). Plugging those probability beliefs into complex formulae could give a false impression of precise knowledge about future returns. I address later Markowitz's omission of qualitative "observation and experience" in the context of the reflective practitioner.

Despite that, I consider the value of Markowitz's paper is that it addressed the importance of ensuring multiple financial capital allocation decisions were diversified in a way which helped to ensure they were minimally correlated. Although Bernoulli's diversification assumed complete non-correlation between his "risky propositions" (Bernoulli 1738), Markowitz has addressed this issue explicitly.

### **1965 – Samuelson's "fair game" market prices**

The behaviour of asset prices has consumed much of the subsequent literature. For instance Samuelson (1965) described the behaviour of stock prices as a martingale pattern in which price fluctuations are capable of increasing as much as they are capable of decreasing thereby producing a "fair game". According to Samuelson this is because everything that can be humanly known about the future price is already built in by market participants who are both intelligent and self-interested:

"This means that there is no way of making an expected profit by extrapolating past changes in the future price, by chart or any other esoteric devices"  
(Samuelson 1965 page 44).

Samuelson postulates this with the caveat "random shocks aside" (page 46) which seems to me to be a large omission later addressed in the behavioural finance literature. This means Samuelson's observations are based on stable markets, when in

reality we know from experience that shocks occur frequently both in terms of macroeconomic shocks and shocks at individual security level.

This focus on market price behaviour continued under Eugene Fama.

### **1965, 1970 – Fama’s Efficient Market Hypothesis**

Fama (1965) demonstrated through empirical data that although share prices showed a generally inclining trend, they followed an unpredictable “random walk”: there being no dependence between past prices and future prices. Although Fama aimed his theory at debunking chartism by which chartists believe past trends can be used to predict future prices, the larger implication of his random walk observation was that price changes are based on the revelation of new information which is inherently unpredictable.

In a later paper Fama (1970) drew together a variety of historic empirical studies and papers to formulate the Efficient Market Hypothesis: “A market in which prices always ‘fully reflect’ available information is called ‘efficient’” (Fama 1970 page 383).

He postulated that it was not necessary for all market participants to have all information in order for an efficient market to exist. Just that sufficient market participants had information and could correctly evaluate price implications so that unwarranted differentials could be arbitrated away. Arbitrage is the assumed mechanism on which Efficient Market Hypothesis is based.

Fama (1970) described three forms of market efficiency: “weak form” in which market prices only incorporated information about historic prices; “semi-strong” form in which market prices incorporated all publicly available information; and “strong form” in which market prices incorporated all publicly as well as privately held information such as that held by insiders. He argued that the empirical tests of various types of market information supported both “weak form” and “semi-strong form”.

Interestingly he considered the empirical tests only partially supported “strong form”, even though that is the form taught both when I was an undergraduate in the 1980s and a post-graduate business school student in 2002.

As we see later in the behavioural finance literature market events in the decades succeeding Fama challenged the validity of the Efficient Market Hypothesis, or at least challenged its usefulness by acknowledging an element of frequent non-rationality in market behaviour.

Furthermore I would point out that all of Fama's empirical evidence only relates to the behaviour of prices in stock markets as that is the only data readily available for research purposes. It has no relevance to off-market transactions. Given that a proportion of capital allocation decisions are agreed privately, Efficient Market Hypothesis provides no guide in those cases, and buyers and sellers instead determine price through their own research of asset fundamentals. We see more of this kind of price determination in the practitioner literature and Chapter 5 case studies.

Twenty years after formulating Efficient Market Hypothesis, Fama (1991) updated his empirically based analysis and argued the continuing validity of the Efficient Market Hypothesis. Although he conceded the strong form of the hypothesis, which he now referred to as the extreme form, does not reflect reality albeit that it does serve as a useful intellectual benchmark from which to consider degrees of efficiency in markets.

Fama is less assertive about Efficient Market Hypothesis than I had been led to believe in my undergraduate training. He acknowledged that markets were only semi-strong at best, that market efficiency takes time to be reflected in prices, and that market efficiency was distorted by periodic investment trends as sectors fall in or out of favour. This is not consistent with how Efficient Market Hypothesis was taught to me as an undergraduate, nor how it is reflected in general press coverage. Given Fama's caveats, he may in fact be closer to his critics than he is to some of his proponents who argue in favour of strong form market efficiency. This misunderstanding of Fama could be attributable to Malkiel (2006) – reviewed below – who appeared to believe in Efficient Market Hypothesis even more strongly than did Fama.

### **1966 – Mandelbrot's criticism of Fama's random walk**

Mandelbrot approaches the subject from a different angle. He was an academic mathematician whose idea was that the geometry of nature is far more complex than the relatively simplistic geometry of Euclidean mathematics. As well as applying this

insight to biology and cosmology, he also argued that it applied to finance and the behaviour of security prices. Mandelbrot's angle was that security prices are linked to their underlying fundamental value, which could in turn be influenced by other variables many of which were potentially knowable. An example given by Mandelbrot was the effect of weather upon agriculture crop prices, where knowledge of past weather patterns including occasional catastrophes such as hailstorms would be useful in modelling future crop prices.

This does assume that fundamental information is available. I know from my experiences as a practitioner that while public listed companies are required to publish their audited financial statements, this information is only produced once each year, is unavoidably several months out of date by the time it gets into the public domain and it is subject to investor interpretation. It is unlikely the market will hold a uniform view of the fundamental value of a particular security at a point in time.

Mandelbrot (1966) usefully challenged Efficient Market Hypothesis but he acknowledged the complexity of determining security prices and did not offer a model to explain how prices move.

### **1973 – Malkiel's blind chimpanzee**

On the other hand Malkiel (2006) wrote in the strongest terms in favour of Fama's Efficient Market Hypothesis. In his 1973 book he wrote that a blindfolded chimpanzee throwing darts at the financial pages could select a portfolio as good as one put together by experts, a claim he repeats in the latest 2006 edition reviewed here.

The opening sentence in his 2005 reflective paper was "I have been an advocate of the efficient market hypothesis for over 30 years" (Malkiel 2005). In supporting this view Malkiel (2005) relies on the fact that professional fund managers consistently have not outperformed market indices to support the idea that markets are efficient in that they incorporate all price-relevant information, an argument also used by other supporters of Efficient Market Hypothesis (eg Bernstein 2006). He presented data showing that over 20 years from 1984 to 2003 90% of large US equity funds underperformed the index (Malkiel 2005 Table 1 page 3) and 80% underperformed in the case of European markets (Malkiel 2005 page 6). This is consistent with my own



findings in the up to date UK Trustnet data Figure 1. Malkiel argued that if it was possible to beat the market through superior analysis, then fund managers would have accomplished that. To further support his view, those funds which did outperform the market did not do so persistently.

To Malkiel's thinking, the failure of professional fund managers to beat the index on a consistent basis proved that all knowable information was built into prices at any given moment. There is therefore no way to beat the market on a consistent basis. As to the clear market irrationality of the dot-com bubble, Malkiel (2006) argues that although we now know prices were informationally wrong, this was not apparent at the time. Market prices during the bubbles were in fact rational albeit based on incorrect estimates of future growth forecasts. Furthermore, "in every case the market did correct itself. The market eventually corrects any irrationality" (Malkiel 2006 page 96). This would appear to admit that market prices are occasionally irrational which would appear to contradict the Efficient Market Hypothesis (also Soros 1994).

Rubbing salt into the wound of his critics, Malkiel (2006) highlighted the 1976 interview with Benjamin Graham (Ellis 1976) in which Graham stated that he had come around to believe Efficient Market Hypothesis; and Warren Buffett who recommended index funds for most investors in his 1996 annual report to Berkshire Hathaway shareholders. We will consider Graham (1976) and Buffett (1977-2012) later. I would suggest here that to quote Buffett in this way is very much out of context as Buffett is a critic of Efficient Market Hypothesis as we will see later and therefore cannot be drawn upon to support Malkiel's position.

I would also observe that fund managers may have underperformed the index for reasons other than extreme market efficiency. By basing his conclusions on 20 years of fund management data, Malkiel's time frame does not coincide with the time horizon adopted by notoriously short-termist and self-interested fund managers (Woolley 2010, Stevenson 2010 and my interview with TR Property Trust's Chris Turner 5 August 2010). In Chapter 1 we have seen similar and updated data in the Trustnet experiment: British investment trust managers have under performed the

market on average. But this does not lead me to conclude that therefore the market is perfectly efficient. Rather it could point to the inadequacies of the fund managers.

Malkiel (2006) concludes that the only way to beat the market is to invest in index funds and to trade as infrequently as possible thereby avoiding both transaction costs and capital gains tax. What Malkiel does not declare is that he is an adviser to the Vanguard index fund, a fund he mentions several times throughout his book<sup>6</sup>. There would seem to be an undeclared conflict of interest in the subject matter.

Another deficiency in Malkiel's argument is that his citation of Buffett (1977-2012), who I will consider later in the practitioner literature, does not address the fact that Buffett's record of consistently beating the stock market over five decades would seem to contradict Malkiel's findings that the market cannot be beaten consistently. Malkiel side-stepped this disconfirming evidence with the following sentence:

“The few examples of consistently superior performance occur no more frequently than can be expected by chance” (Malkiel 2006 page 374).

Either strong form Efficient Market Hypothesis does not explain market prices, or Buffett has been inconceivably lucky (also Lowenstein 2006). I would have liked to have seen Malkiel better explain this anomaly.

Malkiel's arguments therefore strike me as insufficient in their support of Efficient Market Hypothesis. However he does provide a useful critique of the fundamental analytical approach recommended by Graham (1976) and Buffett (1977-2012). He warns that fundamental analysis can suffer from the following weaknesses (Malkiel 2006 page 120):

- The information and analysis might be incorrect or may be based on flawed accounting data.
- Even if the researcher does identify an investment with a great past record of growth there is no guarantee that will continue into the future. Great

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<sup>6</sup> Malkiel's association with the Vanguard fund can be seen on their website at the following link: <https://personal.vanguard.com/us/insights/article/video-malkiel-ellis-06162010> (viewed 10 Dec 2011).

companies like IBM, Apple, Microsoft, Xerox and so forth have a finite period during which they can make superior profits.

- The estimate of value may be faulty.
- The fundamental researcher may have an embedded conflict of interest arising from an investment bank's clientele.
- The actual price might never converge with its value.

These are good challenges and they will be revisited in Chapter 5 as "Malkiel's challenges".

Continuing the theme of asset allocation, we turn to another paper which seemed to represent the kind of portfolio optimisation approach favoured by the academic community.

### **1988 – Hadar and Seo portfolio optimisation**

On the premise that a portfolio will usually consist of a number of assets, Hadar and Seo (1988) take a mathematical approach to determining asset proportions in a portfolio. In order to optimise those assets, the authors use calculus.

I would argue that while calculus can identify maxima and minima when the underlying flow or movement is known, that precondition often does not exist when making projections about the future returns of financial assets.

This limitation becomes evident in the authors' paper when they provide an example intended to show how to optimise asset proportions in a two asset portfolio. The example assumes a known probability distribution for two assets X and Y and then proceeds to use calculus to derive the optimal proportion of each of X and Y.

Similarly Clark and Jokung (1999) use calculus to determine the composition of a two asset portfolio taking account of cumulative future outcomes where one asset has stochastic dominance over the other.

As a practitioner I find the mathematics of these papers is overwhelming in its complexity and therefore I would be cautious about using the derived formulas when making capital allocation decisions. In the practitioner literature reviewed later we do

not find evidence of these approaches being embraced, although of course some firms may embrace them without publishing that fact; and Long-Term Capital Management does appear to have used capital allocation strategies along these lines albeit with disastrous results (Lowenstein 2001).

Reflecting on this part of the literature review, what appears to be lacking is an explanation as to how the X and Y probability distributions were derived. Were they based on historic data? Over what period? Or were they based on estimates of the future? If so, how were those future estimations determined? The Modern Portfolio Theory literature does not provide answers to those kinds of questions. Instead they get relegated to “probability beliefs” (Markowitz 1952). Might I not just as well believe there are fairies living at the bottom of my garden and build sophisticated future plans based on those beliefs? To borrow a Biblical analogy, using calculus to optimise portfolios based on estimations appears tantamount to building a house on sandy foundations.

### **1992 – The Black Litterman portfolio optimisation model**

Black and Litterman started from the premise that mathematical models based on Markowitz (1952) were difficult to use and had not had an unambiguously good track record (Black and Litterman 1992) yet their paper ends up recommending an even more complex mathematical solution to asset allocation. They recommend an approach to portfolio construction that began with neutral weightings in equities, bonds and currencies, with those weightings adjusted depending on the investor’s subjective “views” and “degree of confidence”. Intuitively this sounds like a nicely balanced approach. But therein lies the old chestnut: how to translate subjective, qualitative views about the future into something which can be mathematically optimised using calculus.

The authors were at least explicit in admitting that estimating expected future returns and correlations between different assets invariably involves subjectivity. Furthermore the investor will only have sufficient knowledge to make estimates in a small number of markets – a key epistemic constraint. So if an investor was to venture into non-familiar markets, he or she would typically use data relating to historic

returns. I would observe at this point that a mathematically-based capital allocation model may therefore be unable to distinguish between future return estimates based on an understanding of a particular market and future return estimates based purely on historic returns. The models do not distinguish between good and bad underlying estimates.

Black and Litterman's solution to this problem was to create a neutral portfolio across the investor's chosen market sectors as a "centre of gravity" and to "tilt" the individual asset weightings in accordance with (a) the investor's views of future returns in those markets where he/she was knowledgeable and (b) the investor's degree of confidence in those estimates. The result was what the authors called a "well-behaved portfolio" which lacked the distorted asset allocations that could arise from the Markowitz (1952) mean variance optimisation method. To achieve this result required a probability distribution of future expected returns and a measure of the investor's confidence in those future return expectations. What we see here is that subjective data is being (yet again) translated into quantitative inputs in a mathematical model.

Underlying Black and Litterman's argument was the Efficient Market Hypothesis in at least its partial form: that the market efficiently absorbed all knowledge including expectations of future returns. If we accept the Efficient Market Hypothesis then selecting an equilibrium portfolio through purchasing assets at current market prices and weights is a valid starting point in logic. Conversely if we do not accept the Efficient Market Hypothesis then the wisdom of this starting point is open to question.

I would also note that possible author bias could be present here too as Black and Litterman were employees of Goldman Sachs at the time of writing and their paper's copyright is vested in Goldman Sachs. Goldman Sachs was and still is a leading investment bank specialising in a wide range of overlapping banking, trading and asset management services (Arlidge 2010). It is a firm that appeared frequently during this literature review. By recommending 80% currency hedging, a repeated recommendation in this paper; and by making asset allocation so complex that it seems like wizardry, the authors could be said to be publishing material which drives new business to the experts at Goldman Sachs.

More fundamentally, in studying the Modern Portfolio Theory literature recommending sophisticated and esoteric mathematical approaches to portfolio building (for example see also Latané and Tuttle 1967 and Alb 2004) I cannot help but notice the frequent interspersions of subjective estimates of future asset returns, expected correlations, ad hoc changes to asset weightings to achieve desired results and so forth. I share Graham's caution of highly mathematical approaches (Graham 1976).

So what methods are taught in business schools? I obtained an updated edition of the text I had used when studying corporate finance at London Business School.

### **2006 – Brealey, Myers and Allen's textbook on corporate finance**

The authors have brought together the Nobel Prize-winning academic writings into a coherent narrative supplemented with mathematical formulae. The authors affirm the Efficient Market Hypothesis: markets are informationally efficient and can respond to public releases of information "within 5 to 10 minutes" (Brealey *et al* 2006, page 339). Interestingly the self-assured language is very similar to that used by Malkiel, and they even draw upon the same case study used by Malkiel<sup>7</sup> to demonstrate the markets' tolerance of pricing differentials. But consistent with my own initial finance training in the 1980s, even in the updated version of this text the disconfirming evidence arising from Graham and Buffett do not get even a mention.

We will review the writings of Graham (1976) and Buffett (1977-2012) next, but it would seem to me their experience as practitioners disproves the Efficient Market Hypothesis favoured by Fama (1965), Malkiel (2006) and Brealey *et al* (2006).

### **"What assets do we invest in?": Practitioner approaches**

#### **1920 – DuPont financial analysis**

A system of financial ratios devised by DuPont provided a methodology for analysing financial statements by splitting out net profit margin and asset turnover (Brealey *et al* 2006). As pointed out by Soliman (2008) the DuPont system of ratios separate out the profitability characteristics of a business and the efficiency with which its assets are

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<sup>7</sup> Royal Dutch and Shell Transport and Trading whose shares are quoted on the stock exchanges of both the Netherlands and London.

deployed. Within these two branches ratios were further developed to analyse turnover at individual account level. A useful diagrammatic summary showing the decomposition of ratios under the DuPont system was available free of copyright on Wikipedia<sup>8</sup> and is reproduced as Figure 4.

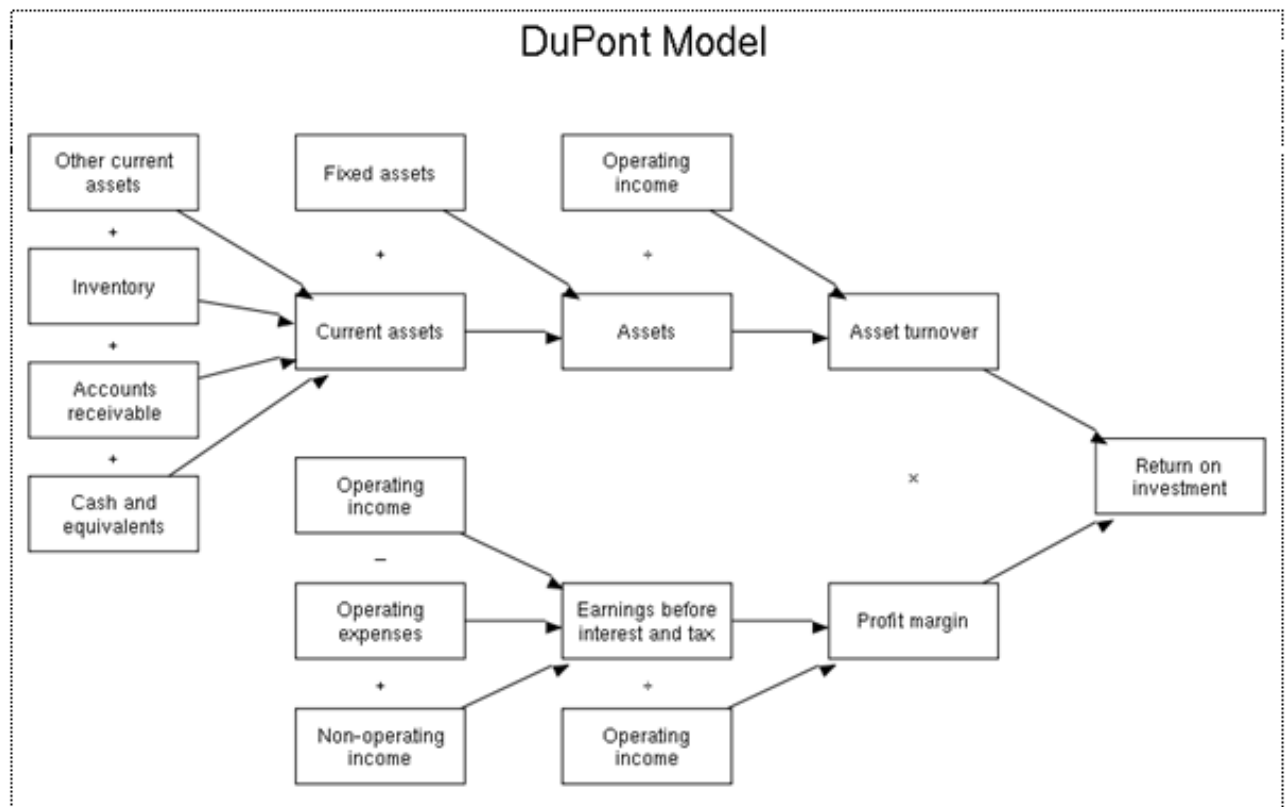


Figure 4 – DuPont system of financial ratios

Note that the DuPont system included account categories from the balance sheet and profit and loss statement but not the cash flow statement. Nor does it include any audit ratios designed to trace potential accounting misstatements, assuming implicitly that the underlying financial statements are wholly reliable. Throughout the literature review the closest I saw to an audit ratio was a binary yes/no AQ (audit qualification) measure used by Arbarbanell and Bushee (1997) but even that was only a reference to whether or not the statutory audit report was qualified and did not distinguish between the various reasons that could underlie an external audit qualification<sup>9</sup>.

<sup>8</sup> Downloaded from <http://en.wikipedia.org/wiki/File:DuPontModelEng.svg#filelinks> authored by Tapir666 and made available in the public domain under CCO 1.0 Universal Public Domain Dedication.

<sup>9</sup> Under Generally Accepted Auditing Standards (in the UK these are published by the Auditing Practices Board) external audit reports can be disqualified on a number of grounds ranging from a disagreement

Nevertheless the DuPont system provides a starting model from which to update and develop a more comprehensive set of ratios making use of the extensive disclosures now available under IFRS and including new original ratios developed from my own experience as a practitioner. This will be carried into Chapter 4's database model construction.

We now turn to a practitioner who put these kinds of ratios to use.

### **1949 – Benjamin Graham the academic and practitioner**

Graham's approach initially devised in the 1940s pre-dated the intellectual landmarks in the development of Modern Portfolio Theory discussed above, which makes his approach interesting from the perspective of seeing how he handled the difficulties Modern Portfolio Theory subsequently sought to address.

Having begun his career as a lecturer at Columbia Business School Graham became a professional investor running his own firm Graham-Newman Corporation. He originally wrote *The Intelligent Investor* in 1949 and updated it approximately every five years, the last update being in 1972, four years before his death. During his investing career at Graham-Newman Corporation he claimed to have generated average compounded annual returns of 20% (Graham 1972 page 532).

Graham is considered as the father of value investing, an approach in which the investor allocates capital to those opportunities which are considered safe and significantly undervalued at the time of purchase.

Due to having been scathed by the Great Depression of the 1930s Graham considered allocating capital across investment opportunities was dangerous (Schroeder 2008) and repeatedly argued that human emotion and psychology led to poor investment decisions. Graham's approach recognised and attempted to compensate for the epistemic limitations of investors by emphasizing the importance of buying securities with a conceptual but not mathematically defined "margin of safety" (Graham 1976) and controlling emotional urges when prices went contrary to expectations.

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on accounting policies to material mis-statement of financial balances, going concern qualification, complete disclaimer of opinion and so forth.



His approach was reflexive in that he recommended the building of “a valuable body of recorded experience ... that may lead to better methods of procedure and a useful knowledge” (Graham 1972 page 300).

A recurrent theme was the need for the allocator of capital to carry out thorough analysis at individual company level, which was significantly different from the analysis of Markowitz (1952), Fama (1991) and Malkiel (2006) who appeared to regard market data as homogenous. Graham recommended investors took the time to go through annual reports including the tedious notes to the accounts which could reveal a range of risks such as use of special charges, dilutive effects of share issues, proforma accounting, special purpose entities, capitalisation of expenses as assets and so forth. “All this may be confusing and wearisome to our readers, but it belongs in our story. Corporate accounting is often tricky” (Graham 1972 page 318).

In contrast to Modern Portfolio Theory, Graham recommended almost no analysis of stock market price data, deviations, covariances nor broker predictions. Graham commented on the increasing use of advanced mathematical techniques:

“mathematical valuations have become most prevalent precisely in those areas where one might consider them least reliable” (Graham 1972 page 281).

Elsewhere he observed:

“mathematics is ordinarily considered as producing precise and dependable results; but in the stock market the more elaborate and abstruse the mathematics the more uncertain and speculative are the conclusions we draw therefrom. In 44 years of Wall Street experience and study I have never seen dependable calculations made about common-stock values, or related investment policies, that went beyond simple arithmetic or the most elementary algebra.” (Graham 1972 page 570).

So what were Graham’s analytical methods? Graham disperses his methods throughout his book which I summarise as follows:

1. “Adequate though not excessive diversification” (Graham 1972 page 114) which he suggested should be from 10 to 30 securities split 50/50 between bonds and equities.
2. Investment in large, conservatively financed companies (Graham 1972 page 114) which he later suggested should be not more than 50% geared with debt (page 122).
3. A long history of dividend payments, ideally for each of the past 20 years (Graham 1972 page 114).
4. A seven year average price-to-earnings ratio of not more than 25 (Graham 1972 page 114) although elsewhere he recommended “no more than 15 times average earnings for the past three years” (Graham 1972 page 338 and page 349).
5. Buy companies at a low price – ideally less than their tangible net book value (Graham 1972 page 9, page 166) or at least not more than 1.5 times last reported book value (Graham 1972 page 349). He modified this to  $PE^{10} \times NBV^{11} \leq 22.5$  to allow for companies with a high market capitalisation but compensating low PE ratio or vice versa (Graham 1972 page 349).
6. A consistent track record of earnings growth over the past ten years with no earnings deficits (Graham 1972 page 338).
7. Investments which include a “margin of safety” to which Graham devoted an entire chapter. To Graham “margin of safety” meant the excess of the earnings yield ( $1/PE$ ) over the return on bonds (Graham 1972 page 514) which he implied through example should be at least +5%.

Graham recommended analysing financial ratios relating to leverage, dividends and price to earnings. The price-to-earnings ratio is interesting as Graham recommended looking at not just the latest earnings, but using an average of the past seven years. This requires a great deal of data when multiplied out across all investment opportunities available at any point in time. However it brings the important advantage of ironing out ratio anomalies that could arise if one year’s earnings were

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<sup>10</sup> PE is price-to-earnings ratio, i.e.  $\frac{\text{price}}{\text{earnings}}$ .

<sup>11</sup> NBV is net book value, i.e. the value of assets less liabilities. On a typical balance sheet this is equal to the value of shareholders equity.

unusually high or low due to one-off gains or special charges. Usefully he provided his own analytical spreadsheet which reveals the use of a greater number of ratios than referred to in the text. Together with the DuPont system Graham's ratios provide additional experiential metrics for a database structure in the research phase of this project.

Graham did a question and answer session with the *Financial Analysts Journal* (Ellis 1976) a few months prior to his death. In this interview Graham was critical of the investment community for constantly trying to guess short term market movements. He remained generally consistent with his advice in *The Intelligent Investor* (Graham 1976) although he did make a surprising revelation. In his own words:

“I am no longer an advocate of elaborate techniques of security analysis in order to find superior value opportunities. This was a rewarding activity, say, 40 years ago ... but in the light of the enormous amount of research now being carried on, I doubt whether in most cases such extensive efforts will generate sufficiently superior selections ... I'm on the side of the 'efficient market' school of thought now generally accepted by the professors” (Ellis 1976 page 22).

From this statement it appears Graham's views had adopted Fama's Efficient Market Hypothesis (Fama 1970). Given that elsewhere in the interview he continued to recommend his value based approach to finding undervalued companies, his agreement with the Efficient Market Hypothesis must have been in its weak form rather than its strong form, otherwise Graham would probably have recommended an index fund as the capital allocator's only logical option.

In critiquing Graham I would offer a few observations.

In claiming to have achieved an average return of 20% per annum, Graham included only the period of Graham-Newman Corporation from 1938 and not his prior investing results. In fact Graham was an active investor long before this and it is reported that he sustained devastating losses in the 1929 stock market crash (Lowenstein 1998, Schroeder 2008). Although he makes little reference to 1929 it is likely it shaped his

subsequent approach to allocating capital with utmost care and explicit concern for capital safety.

Graham's reliance on the price-to-earnings ratio may not be appropriate. Although price can be objectively determined from the market, as an accounting measurement earnings is vulnerable to accounting manipulation.

Graham's stringent approach to filtering out all but the safest and most attractive investments would automatically exclude most listed securities from the investor's universe. Initial public offerings, smaller companies, companies which do not pay dividends would all be excluded from consideration. Graham's criteria seem to aim at minimising the capital allocator's epistemic risk. Munger would later criticise this approach (Lowenstein 1998) as inducing investors to allocate their capital to only the cheapest, low quality opportunities.

On diversification Graham offered no clear description of how that is to be achieved other than 50% bonds and 50% equities plus or minus 25% on each side (Graham 1976). He did not mention other forms of diversification such as non-US investments, property, commodities or off-market opportunities such as unlisted companies or joint ventures, all of which would potentially meet his stringent criteria and provide further opportunities for diversification.

Related to this Graham offered no way of determining how to diversify, unlike Markowitz (1952) who used co-variance to achieve optimum diversification within a portfolio. Graham did not comment upon individual security correlations, determination of individual security investment limits, nor did he put forward any theoretical nor even empirical support for his 50/50 approach to diversification. His entire approach appears to be based on intuition, albeit intuition that was experientially shaped by decades of practice.

Graham's approach has been utilised by Warren Buffett, who has been regarded as the world's most successful investor for at least the past 30 years (Schroeder 2008). Buffett has made numerous favourable references to Graham throughout his own writings, even naming his son after Graham (Lowenstein 1998).

## 1977 to 2011 – Buffett’s comments on Modern Portfolio Theory

Graham’s student, Warren Buffett was recognised in a 2009 BBC documentary as “the world’s greatest money maker”, having built up a \$44 billion fortune during his lifetime making him the third richest person in the world according to the 2012 Forbes list of billionaires. The studies on the Efficient Market Hypothesis are often supported by empirical data showing the inability of practitioners to beat the market as evidence that the market cannot be beaten on a consistent basis (e.g. Malkiel 2006). The problem is that Buffett has beaten the market on a consistent basis which would appear to be disconfirming evidence. It is therefore of interest to review what Buffett has revealed about his capital allocation methods.

Lowenstein (1998 page 202) had access to at least some of Buffett’s correspondence, close associates and family members, and at least one interview with Buffett himself. Schroeder (2008 page 929) had greater freedom in interviewing Buffett at a later stage of his career, his family and friends and in reviewing his archives. Buffett himself has written annual reflexive letters to his Berkshire Hathaway shareholders since 1977 all of which I obtained from [www.berkshirehathaway.com](http://www.berkshirehathaway.com) and compiled into an electronic database for the purpose of this research. Cunningham (2002) was a useful compilation of the key themes of Buffett’s shareholder letters.

Buffett was taught by Benjamin Graham at Columbia University. Buffett subsequently joined Graham-Newman Corporation as an employee (Schroeder 2008). He later began his own independent investment partnerships and purchased textile company Berkshire Hathaway in 1964. Although the textile business was ultimately unsuccessful Berkshire Hathaway is now the holding company of Buffett’s investments and is included in the Chapter 5 case studies due to its paradigmatic significance to the research questions.

A repeated theme in the literature is Buffett’s attention to voluminous research. One of his colleagues at Columbia University in 1951 said “Buffett knew almost every balance sheet on the New York Stock Exchange” (Lowenstein 1998 page 45). When later running his partnerships in the early 1960s Buffett spent his days reading company annual reports amounting, in his own words, to “a couple of thousand” each

year (Lowenstein 1998 page 130). When visiting companies he had a record of asking “questions like crazy” about products, marketing and future sales prospects (Lowenstein 1998 page 128). Consequently he always had an array of capital allocation options (Lowenstein 1998 page 132) so could take an opportunistic approach which is explicitly stated in his 1995 letter:

“We do have a few advantages, perhaps the greatest being that we *don't* have a strategic plan. Thus we feel no need to proceed in an ordained direction (a course leading almost invariably to silly purchase prices) but can instead simply decide what makes sense for our owners. In doing that, we always mentally compare any move we are contemplating with dozens of other opportunities open to us” (Buffett 1995 letter to shareholders).

This suggests continuous attention to research. Schroeder confirms research is one of the secrets to Buffett's success (Greer 2010). Coincidental with his constant research, both Lowenstein and Schroeder include numerous observations from close family members of his lack of attention to domestic matters.

Because Berkshire Hathaway is a US public company, much about his capital allocation decisions is publicly disclosed. Buffett's focus on measuring company value led him to sell heavily just prior to the stock market crashes of the mid 1970s, 19 Oct 1987 'black Monday' and he side-stepped the 1999 to 2001 dot-com boom and bust (Schroeder 2008). On each occasion he resumed buying after the crash when prices were low. Although his biographers do not spell it out explicitly, it is evident that Buffett has also influenced his investees not to allocate capital expensively too (Schroeder 2008). So not only did Buffett avoid expensive mistakes with money directly under his control, those of his investees where he obtained a board directorship also avoided expensive mistakes thereby providing Berkshire Hathaway with double insulation against capital allocation errors.

Although Buffett (1977-2012) repeatedly makes reference to the value of Graham's teachings, he departed from Graham and developed his own approach in collaboration with his business colleague Charlie Munger. Rather than merely focusing on allocating capital to companies that were extremely cheap, often because they had fundamental

problems, he sought companies which had monopolistic dominance of their respective markets, even if the purchase price did not meet Graham's criteria (Lowenstein 1998). Such investments included American Express, Disneyland, Coca-Cola and Gillette, each of which he bought when the share prices had suffered downgrades. His best purchases were done at low price-to-earnings ratios. The highest I noted was 16 (Lowenstein page 263), Coca-Cola was purchased at 13 (Lowenstein page 329) but most purchases were around five to ten. He purchased Nebraska Furniture Mart in its entirety at a price-to-earnings ratio of only four (Lowenstein page 250) from an illiterate immigrant widow in her nineties. A BBC documentary questioned the ethics of that particular deal (Davis 2009).

Buffett is open to suggestions. In the late 1990s I corresponded with Buffett by email about the opportunity to buy British Land PLC, in which I was a shareholder, at a price likely to be less than its net asset value, a transaction which subsequently did not take place. His communication with me at that time was consistent with his approach to asset safety. He agreed it was a quality asset of interest to him but he would only proceed at a low price. The speed of his response also demonstrated – to me at least – that he was internationally aware of a range of capital allocation options, as observed by Lowenstein (1998) and Schroeder (2008).

Unlike Graham (1976) and Slater (1998), Buffett has not revealed his analytical methods. Given his adherence to Graham it is likely he takes a similar approach to quantitative analysis. One of his recurring metrics is return on capital ( $\frac{\text{earnings before interest and tax}}{\text{capital employed}}$ ). The lowest return on capital benchmark acceptable to Buffett was 10% (Lowenstein 1998).

Where he was later able to influence those companies his advice was aimed at increasing return of capital through improved sales, mark-ups, fast collection of debtors and inventory minimisation (Lowenstein 1998). These are the kinds of measures I have also come to practice in my client work after two decades of professional experience which have led me to help clients save millions of pounds (for example Kelly 2003, Kelly and Nelms 2004, Kelly 2008 and Appendix 9).

Yet another of Buffett's metrics was free cash flow, which he defines as reported earnings plus depreciation, amortisation and other non-cash charges added back less the average annual capital expenditures required for the company to maintain its competitive position (Lowenstein page 325). The second part of this equation is unique in the literature as it behaves as a substitute for depreciation and recognises a minimum amount of reinvestment is required in almost any business – not all the profits can be returned to shareholders each year.

To date, criticisms of Buffett have only emerged when markets were down shortly after which Buffett was once again vindicated (for example Sosnoft 1999, Francis 2008, Francis 2009, Gardner and Moore 2010).

Buffett has undoubtedly allocated his capital adroitly. Looking around my home Buffett's products are everywhere: Pantene shampoo, a Gillette razor, Duracell batteries, bottles of Coca-Cola and Sprite, Fairy dishwashing liquid, Ariel laundry detergent, my wife's Olay and Max Factor cosmetics, Johnson and Johnson baby lotion, digestion aid Metamucil, Disney DVDs and probably other items I have missed. I also find these products at the homes of my British and Australian friends, family and even my in-laws in China. Buffett has allocated his capital into pedestrian and relatively inexpensive products routinely purchased throughout most of the world.

There are some aspects of his approach which are open to question. Buffett takes enormous risks in "super-cat" insurance and this only gets a passing reference in Lowenstein (1998), Schroeder (2008) and Buffett's own shareholder letters. It seems to be called "super-cat" as that sounds better than its full title: "super-catastrophic". What this means is that Buffett insures mega-disasters, such as earthquakes and hurricanes, where probabilities are difficult to estimate and losses are potentially enormous. A bad year of multiple natural disasters could be a material drain on Berkshire Hathaway's resources forcing it to sell investments, probably at an unfavourable time. In fact while writing this literature review Berkshire Hathaway was stung by the near-simultaneous catastrophes of 2011 Australian floods, 2011 New Zealand earthquakes and the 2011 Japanese tsunami which he has since reported will bring about a significant insurance loss for 2011 (Phillips 2011).



In his eighties Buffett's longevity and lack of a successor is a risk to Berkshire Hathaway's shareholders. Buffett might counter that the companies he has invested in will go on creating excellent returns long after society mourns his passing. In reality he will be unable to shepherd those companies' capital allocation decisions and his influence on Berkshire Hathaway's subsidiaries will likely dim with the passage of time.

### 1977 to 1990 – Peter Lynch

Similar to Buffett, Lynch was a professional investor. Jackson (2010) points out that from 1977 to 1990 Lynch achieved an average annual return of 29%, outperforming all other high profile investors including Buffett.

Like Buffett and Slater, Lynch recommended only investing in one's known area of competence and not trying to second guess future macroeconomic trends like interest rates, inflation and future investing trends as these are too complex for even the best minds to grasp (Jackson 2010). I would add that macroeconomic policies are subject to unknowable future political influences.

Lynch claimed he invested in 25 companies that had promising growth prospects. None of them succeeded. Like Graham (1976), Lynch's advice was to stay with companies with a proven track record (Jackson 2010).

On checking the figures in Jackson (2010) I found an error: It is inaccurate to say Lynch outperformed Buffett. Although Buffett has achieved an annual return of around 20%, his investing career extended over a longer time period than Lynch with Buffett enduring the down cycles of the mid 1970s, the dot-com bubble and the Global Financial Crisis. On checking Buffett's performance over the same period that Lynch was active by listing his annual returns for the same years as Lynch, I was able to calculate that Buffett achieved 28% average annual return which closely matches that of Lynch.

Allocators of capital in the UK appear to have spent their time allocating their capital rather than writing about it. However there is one British practitioner who has written in detail about his approach: Jim Slater.

## 1998 – British investor Jim Slater

Slater recommended what he calls the “Zulu Principle”: developing a narrow circle of competence in a particular sector which can lead to superior investment decision-making; and a set of supporting metrics (Slater 1998).

Like Graham and Buffett, Slater (1998) takes an analytical approach at individual company level using mainly accounting data to ascertain a company’s value, likely future prospects and comparing that to price in order to decide whether to allocate capital.

Unlike Graham and Buffett’s preference for cheap bargains, Slater (1998) preferred to allocate capital to companies which had significant growth prospects. The problem with this approach is that it requires greater faith in unknowable future variables. “‘Something new’ can often be a good reason to buy a company’s shares” (Slater 1998 page 118). So whereas Graham made conservative assumptions about the future and building in a margin of safety, Slater recommended a more optimistic view. Did Slater have the competence to draw such a conclusion: possibly yes if he remained within his circle of competence. But that in turn narrows the field of available opportunities. In fact the weakness of Slater’s approach is evident in some of the companies whose growth prospects he admired at the time of writing, including Psion and Rentokil whose growth did not continue in the way Slater may have hoped.

Slater’s preferred analytical metric is the Price-Earnings Growth factor (PEG) (Slater 1998) which is calculated as:

$$\text{PEG} = \frac{\text{Price}}{\text{Earnings}} \times \frac{100}{\text{Growth rate \%}}$$

The problem with this formula is that the result is highly sensitive to the assumed future growth rate. Where does Slater’s future growth rate come from? Past growth is not necessarily a reliable indicator of future growth prospects, so inevitably the allocator of capital has to rely on broker forecasts or make a subjective estimate. Slater further complicates this formula by claiming PEGs between different companies need to be adjusted to synchronise differences between varying year end dates. He supports this argument with an analogy of the growth rate of babies where three

months can represent a noticeable difference. I consider this argument lacks weight as differences in company year ends are only a matter of months and are unlikely to affect historic analysis and future estimates which cover several years as recommended by Graham (1976). Also the baby analogy would only really apply to start-up businesses, not to established companies which are the focus of Slater's book. I feel his argument of the importance of PEG synchronicity is more likely to be a selling point for his subscription-based REFS database and therefore a conflict of interest.

Slater (1998) emphasises the importance of cash flow which he says should exceed earnings in each of the past five years.

He makes a useful observation that goodwill is a balance sheet anomaly which should be excluded from calculations of return on capital employed in order to be able to compare different companies. His benchmark of a good return on capital employed is 20% or higher (Slater 1998 page 91).

Slater highlights the effect that a modest increase in earnings per share can have on the share price. Due to the price-to-earnings ratio formula,  $\frac{\text{Price}}{\text{Earnings Per Share}}$ , a modest increase in earnings will necessarily cause the price to go up also just to maintain the same price-to-earnings ratio. But what often happens simultaneously is that the PE ratio itself increases which represents a further enhancement to price (Slater 1998). So therefore an increase in earnings can have a double benefit to an asset price. Although Slater does not say it, the opposite is also true: a decline in earnings can have a double whammy negative impact on the price.

Slater continually makes reference to the growth prospects of diverse sectors (Slater 1998). Having recommended a narrowly focused approach within a defined range of competence, he then seems to veer across too many sectors. Taking all of that into account, we learn more about capital allocation methods from Graham (1976) and Buffett (1977-2012) than we do from Slater.

Returning to the US, an innovative approach emerged at the beginning of this millennium from US consulting firm Stern Stewart and Co.

## 2001 – Stern Stewart and Co's Economic Value Added model

Economic Value Added (EVA) is the centrepiece of Stern, Stewart and Chew (2001) and is a registered trademark of US consulting firm Stern Stewart and Co. It is based on the underlying concept that the capital invested in any business is not free. Whether the capital is provided by lenders or shareholders, they will require management to repay an adequate return on that capital. This concept has been firmly embedded in finance thinking since Modigliani and Miller (1958). What Stern Stewart and Co have done is created an analytical model designed at making this academic concept work in the real-world. That immediately draws our attention to a potential bias: by publishing their approach the authors are likely seeking to attract clients and therefore do not wish to give away all the details of their methodology.

With that in mind, the article makes the point that the frequently used earnings per share (EPS) measure is an inaccurate tool for evaluating business performance on a number of grounds (Stern *et al* 2001):

1. EPS combines all the activities of a company into a single measure thereby concealing the performance of each individual business segment.
2. EPS can be grown simply by acquiring new investments even if those investments return less than the cost of capital, a problem the authors refer to as “overinvestment” and which was warned about by Modigliani and Miller (1958) considered later.
3. Traditional performance measures and remuneration set by head office based on EPS may not positively incentivise divisional management to out-perform prior year achievements.

Stern *et al* (2001) argue that a better alternative to earnings per share is after tax cash flow after recognising a notional cost of capital. One interesting implication pointed out by the authors is that management who focus on maximising after tax cash flow ought to seek ways to suppress reported earnings to reduce tax costs. Suppressing reported earnings is precisely the opposite approach management usually take, which is to maximise reported earnings despite the fact this may incur additional tax costs.

The authors see high leverage as a way of improving corporate discipline and reducing the cost of capital. However the authors do concede an increasing incidence of bankruptcies when high leverage is used (Stern *et al* 2001 page 139).

The EVA formula is described by the authors as being net operating profit after tax less a charge for the weighted average cost of capital employed as determined by the Capital Asset Pricing Model (Sharpe 1964). EVA is therefore the profit after tax minus the weighted average cost of capital, where the accounts are adjusted for any significant GAAP anomalies such as inventory valuation, depreciation, revenue recognition, pension or other hidden liabilities, overhead allocations and so forth which might apply to a particular company. In addition to only investing in projects which exceed the cost of capital (or disinvesting from projects whose returns fail to exceed the cost of capital), the authors also argue that EVA incentivises management to run an efficient balance sheet by minimising the weighted average cost of capital.

A later paper by Chong *et al* (2009) presents an analytical and empirical study on the benefit of using the EVA technique as a long term capital allocation tool back-tested on US shares over 1994 to 2005 thereby including the dot-com bubble both during and after. All of the authors are US academics and none appear to be associated with Stern Stewart and Co so there is no reason to suspect any commercial bias.

In the Chong *et al* (2009) study the authors examined three portfolios: the top 100 US companies ranked by EVA, the bottom 100 US companies ranked by EVA and the Standard and Poor 500 index over the period 1994 to 2005. The results showed that the top 100 EVA ranked companies consistently outperformed the market index and, significantly, did not produce negative returns at a time when the market index did produce negative returns. On the other hand the bottom 100 ranked companies did show considerably higher volatility than the market and made significant negative returns greater than the market during the dot-com crash. The authors therefore conclude that EVA does contain information that is beneficial to those who allocate capital.

Their recommendation however seems paradoxical: that portfolio managers should invest in low ranked EVA companies during market upswings, due to their higher

volatility; and to invest in high ranked EVA companies during market downswings, due to their out-performance. I disagree: not only does this incur transactions costs and crystallisation of taxable capital gains, which the study ignores, but it also presumes portfolio managers will be able to identify precisely when the market is in an upswing and when it is in a downswing.

Another criticism I would offer on Chong *et al* (2009) is that obtaining information on EVA relies on obtaining the rankings from Stern Stewart and Co's website. Although it was available at the time of the authors' study there is no guarantee such privately generated data will always be available nor are there any assurances on its accuracy. In any case it does not cover non-US companies, or non-corporate investments such as property, commodities or off-market opportunities and is therefore of limited utility.

In critiquing EVA, it seems to be a real-world and practical methodology for implementing Modigliani and Miller (1958) Proposition III which will be considered later. However the Stern Stewart paper reads as a sales brochure and implies EVA when properly implemented will invariably improve capital allocation performance, within a matter of months if their case studies are to be believed. Yet the authors hold back on divulging their actual mathematical adjustments in converting GAAP accounts into measures appropriate for EVA which may coincide with the likely commercial motive underlying this paper. The methodology also encourages management to take on debt which in turn increases the risk of bankruptcy. Nonetheless with my accounting and finance training this article is sufficiently descriptive to carry a few ideas into the case studies.

So if the academic and practitioner communities have gone down different paths, has anybody tried to bring them together? Fortunately Harris (2005) has done this.

### **2005 – Practitioner and academic roundtable discussion**

In the *Journal of Applied Corporate Finance*, Harris (2005) reported the discussions of a panel of academics and seven practitioners from US institutional investment firms including Morgan Stanley and Goldman Sachs who were collectively managing “over \$200 billion of assets” at that time (Harris 2005). This paper was useful for comparing

the principles underlying Modern Portfolio Theory discussed earlier with the various approaches taken by the practitioners.

Each of the practitioners at the panel had a different approach to asset selection and none explicated their methodologies. As I also know from my own professional experiences, dissemination does not come easily to practitioners. But there were some common themes which are relevant to my research here (Harris 2005):

- The discussion gave the sense that none of the practitioners were dogmatic in their approach, all had engaged in experimentation with different analytical techniques and all were prepared to modify their approaches with experience.
- Six out of seven of the practitioners used reported accounting data as their primary source of information prior to making asset selection decisions. The one who did not use historic market price charts, that is the chartist approach discredited by Fama (1965).
- Two of the practitioners made explicit emphatic remarks about cash flow data as less vulnerable to manipulation than reported earnings.
- By implication all of the practitioners were of the view that the market is periodically inefficient in the terms of Fama (1991) and Malkiel (2006) and that this presents investment or disinvestment opportunities to exploit those market price inefficiencies.
- All of the practitioners made references to their desire for quick paybacks on their asset selection decisions, with two specifically referring to three year time horizons.
- In analysing risk, the practitioners were generally of the view that academic approaches as embodied in the Capital Asset Pricing Model and beta (Sharpe 1964) were of little practical utility in asset selection decisions due to being the labelling of historical empirical data correlations with little predictive power.

As to determining an approach to understanding value and risk in order to support capital allocation decisions, this paper did not have a solution. Continued experimentation appeared to be the conclusion.

Harris (2005) surmised that the relatively new behavioural finance literature considered next and which has drawn upon psychology and sociology to help understand abnormal market pricing may help in better understanding whether irrational asset pricing presented asset selection opportunities.

### **“What assets do we invest in?”: Behavioural Finance Theory**

While the academic literature on Modern Portfolio Theory was highly mathematical, the practitioner literature adopted hybrid mathematical and qualitative approaches to capital allocation decision-making. Another branch of literature which appears to bridge the academic and practitioner approaches is found in behavioural finance. Within this I included literature relevant to experience-based intuitive decision making.

### **1985 – De Bondt and Thaler market inefficiencies**

De Bondt and Thaler (1985) attributed market prices to human behaviour. They used historic price-to-earnings ratios to assemble what they called winner and loser portfolios and then showed that loser portfolios outperformed subsequently. De Bondt and Thaler argued that assets with low price-to-earnings ratios represent better value than assets with high price-to-earnings ratios which is then reflected in subsequent price performance, an apparent contradiction of Efficient Market Hypothesis. The reason the market is not efficient in the sense asserted by Fama (1991) and Malkiel (2006) is that the market has an inbuilt overreaction bias which is not automatically arbitrated away. The authors support their hypothesis with market data from which they assemble their two portfolios.

Graham (1976) and Buffett (1977-2012) would agree that market prices are often not efficient. However neither Graham nor Buffett relied exclusively on the price-to-earnings ratio for portfolio construction. Both Graham and Buffett took a more asset-specific approach rather than only filtering the entire market on only one ratio. De Bondt and Thaler (1985) do open a door into a new way of understanding market price anomalies that gained support following the erratic price behaviour of the dot-com bubble which occurred a decade following their paper’s publication.



## 1999 – Intuitive decision-making

Although not directly related to behavioural finance, survey research by Burke and Miller (1999) and a wide-ranging literature review by Dane and Pratt (2007) analysed the utility of intuition, as contrasted to cognitive rational analysis, in management decision making. The studies recognised that intuition in workplace decisions was most often used alongside data, with intuition filling in gaps and also accelerating the decision process where data was not available due to time or other constraints. Burke and Miller (1999) suggested the following conceptualisations of intuition: experience based intuition derived from training and experience; affect initiated intuition based on emotions and pleasures; intuition based on personal or corporate values; and subconscious mental processing. The importance of intuition to decisions as pointed out by Dane and Pratt (2007) is that it uses the human brain which can process data as well as data gaps more inventively than the formalised structures of purely computational models. While quantitative methods can deal with large volumes of fundamental data, intuition seems potentially better equipped to process data which may be complex, nebulous, predictive or even absent. In this way experiential intuition can be used either separately from or alongside rational data analysis.

Although intuition with insufficient data could lead to a dangerous “feeling of certitude” (Dane and Pratt 2007 page 39) and poor decisions, the success of intuition was more likely to be enhanced when the experienced practitioner improved future decisions by augmenting their knowledge through continuous education and professional networking, experiential diversification for example through job rotation, learning from the consequences of others’ decisions and reflecting on past decision outcomes (Burke and Miller 1999). With the diversity of my own workplace experiences across multiple industry sectors and geographies as summarised in Chapter 1 I may have an advantage when seeking to incorporate experiential intuition into an asset allocation model.

For this research, experiential intuition can serve two purposes: firstly in the capital allocation decision itself where experiential intuition as well as rational data analysis both have roles to play, as was also seen in Graham (1976) and Buffett (1977 – 2012); and secondly in seeking assets which leverage experiential intuition as part of

organisational development in contrast to, say, an apparent over-reliance on quantitative analysis as appeared to be the case in Markowitz (1952) and at LTCM reviewed later.

### 2002 – Further attacks on Modern Portfolio Theory

US fund manager Curtis (2002) attacked Modern Portfolio Theory in the *Journal of Wealth Management* shortly after the collapse of Long-Term Capital Management. Curtis argued market reality could be “breathtakingly” different from the over-simplified assumptions of Modern Portfolio Theory.

“Mathematical analyses only provide an abstract framework within which scientific conclusions can be drawn without direct reference to the actual reality of the capital marketplace ... and that reality [behaves quite differently from] the elegant but sterile equations of the Modern Portfolio Theory gurus” (Curtis 2002).

Like other writers, Curtis (2002) was particularly critical of standard deviation as the measure of risk in Modern Portfolio Theory on the grounds that standard deviation was usually calculated on historic price volatility and ignored other kinds of risk. His most explicit condemnation was that “Modern Portfolio Theory is simultaneously an elegant explanation of market behaviour under a set of very simple rules and also completely clueless about market behaviour under most real-world conditions” (Curtis 2002).

Along similar lines Mandelbrot and Taleb (2005) offered the usual mathematical criticisms of Modern Portfolio Theory and also argued that rather than following a random walk (Fama 1965), markets had a memory particularly of past crashes, and that market behaviour adapted accordingly thereby increasing volatility. Measures derived from *historic* volatility, most notably beta, are therefore irrelevant as a predictive tool.

New York Times journalist Nocera (2006) was another critic of Efficient Market Hypothesis and in particular its implications for professional and regulatory behaviour. He made an interesting point that because markets were believed to be efficient in

Fama (1991) and Malkiel (2006) terms, bubbles were not visible because in theory they did not exist. Nocera (2006) quoted the quarterly newsletter of a US asset management company which placed the blame for lax regulator behaviour and misplaced government confidence in a belief that Efficient Market Hypothesis would ensure rational market behaviour and automatically corrected any mispricings. Nocera (2006) went further and postulated that the doctrine of Efficient Market Hypothesis could be said to have caused the Global Financial Crisis.

In examining the validity of Nocera's argument it is worth noting he debates against the strong form of Efficient Market Hypothesis. Although Malkiel (2006) endorsed strong form, in fact this is not what Fama (1970) said although it is consistent with how Efficient Market Hypothesis is represented.

In defence of Fama, we appear to have become wise after the event. Even under strong form Fama (1970) did not say the market was rational but rather that market prices follow a random walk, which does not suggest rationality. Efficient Market Hypothesis as defined by Fama does allow for time lags between market price adjustments, and it also allows for longer time lags owing to periodic market trends or bubbles.

What is interesting about Nocera (2006) is that it highlights how Efficient Market Hypothesis has been popularly misunderstood, even within professional and regulatory circles. The hypothesis has encouraged – in a way Fama probably did not intend nor anticipate – a blind faith in market behaviour which is now exposed to challenge following a series of market bubbles and crashes.

### **2006 – Lowenstein's concerns about rational investors**

Lowenstein (2006)<sup>12</sup> concentrates on the apparently irrational behaviour both during and after the dot-com bubble between 1999 and 2003. He identified a group of market participants who avoided the devastating losses suffered by most market participants. Lowenstein (2006) draws the explicit conclusion that Efficient Market Hypothesis does not explain prices. In his own words:

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<sup>12</sup> This is *not* the same Lowenstein who wrote the biography of Buffett (Lowenstein 1998).

“Markets are efficient much of the time, they’re efficient in the long run, but they’re not efficient all of the time ... The EMT model thus has no predictive or analytic power” (Lowenstein 2006 page 70).

His argument goes wider than an attack on Efficient Market Hypothesis to include an overemphasis on short holding periods, a misunderstanding of business risk which is not homogenous among all investors (also Kahneman 2009) and an emphasis by most institutional market participants on gathering assets upon which administrative charges can be levied. Woolley (2010) had similar concerns about the unethical and value-destructive behaviour of institutional market participants.

Lowenstein (2006) argues that those who avoided the carnage of the dot-com bubble, including Buffett, took an asset-specific analytical approach, a long-term horizon and invested their own assets alongside those of their clients.

### **2010 – Markets appear to be inefficient**

Behavioural finance has gone even further to argue that market prices are not only informationally inaccurate but that they tend to swing from one irrational extreme to another. Woolley (2010) has argued that that most funds channelled into public markets are transmitted via intermediaries including managed funds, hedge funds, pension funds and investment banks. Not only does this present behavioural problems around principal/agent, such as asymmetry of information, misaligned interests and misaligned time horizons, but intermediaries have become increasingly self-interested and short-termist to the detriment of their clients.

This contributes to frequent asset mis-pricing leading to bubbles and crashes.

Ultimately the cost is borne by the intermediaries’ end stakeholders – typically sovereign wealth funds, charities and employees saving up for retirement. There were other papers in the literature with similar concerns, for instance Stevenson (2010) of the Financial Times and Millstein (2010) of the London Business School Alumni Investors Club.

Woolley (2010) argued that regulators and market participants assumed the financial sector was so large and competitive that competition kept the financial intermediaries

honest. The fact that the executives in the financial sector received outsized bonuses was overlooked due to the tacit belief that they were providing an essential and competent service to the economy. This behavioural self-interest of fund managers was also alluded to in Harris (2005) where it was acknowledged that the ability to manage billions of dollars of other peoples' money and charge fees thereupon was a privileged position. To quote Harris (2005 page 73): "Yes it is a lucrative game – and that's why people behave the way they do. Just getting on the ladder is a great outcome; most portfolio managers are getting paid to play, not to win."

Returning to Woolley (2010):

"The technology bubble ten years ago provides a good illustration of this process at work. Technology stocks received an initial boost from fanciful expectations of future profits from scientific advance. Meanwhile, funds invested in the unglamorous, 'value' sectors languished, prompting investors to lose confidence in the ability of their underperforming value managers and to switch funds to the newly successful growth managers, a response that gave a further boost to growth stocks. The same thing happened as value managers themselves began switching from value to growth to avoid being fired" (Woolley 2010 page 126).

Asset pricing is therefore a battle between fair value and behavioural momentum forces. Agents seek bonuses and job preservation and this produces pricing anomalies. The momentum becomes self-reinforcing until the bubble can grow no more at which point it bursts.

The weakness of the behavioural finance papers is that they explain their theory after the event. In defending his Efficient Market Hypothesis Fama (1991) debunks the price anomaly studies of behavioural finance on the grounds that over-reactions are as frequent as under-reactions and that therefore the market remains price efficient in the long term.

Where I respectfully disagree with Fama is that his papers (1965, 1970, 1991, 1998), and those of the Modern Portfolio Theorists, analyse market data in aggregate and fail

to recognise that individual securities are not homogenous. The distinguishing characteristic that the behavioural finance academic literature and the capital allocation practitioner literature have identified is the importance of the fundamental accounting data of each market participant. Ironically this is not a contradiction of Efficient Market Hypothesis. As I pointed out earlier, the practitioners do expect market prices to align with information in the long term as predicted by Fama (1991). It is Malkiel's (2006) extreme form of market efficiency that the behavioural finance theorists are in disagreement with.

### **“How do we raise the money?”**

We now turn to the second thought bubble in the Figure 2 mind-map. This area of the literature discusses where the capital comes from in the first place and its role in the capital allocation process.

### **1958 – The Modigliani and Miller propositions on the cost of capital**

Returning to the Figure 2 mind-map, capital is not provided to managers by investors or lenders free of charge. Both expect a return. Businesses can only be profitable if the returns exceed the cost of that capital. The importance of understanding the cost of capital is that firms can only create value sustainably through taking on projects which yield returns in excess of the cost of capital (Stern *et al* 2001), so being able to estimate the true cost of capital is of importance to all capital allocation decisions.

Modigliani and Miller (1958) recognised that while the cost of debt was the rate of interest on that debt and was therefore calculable, the cost of equity was more difficult to ascertain due to the uncertainty of the equity holder's future returns. The authors pointed out that at the time of writing the cost of equity capital was usually considered as the interest rate on bonds plus a non-defined adjustment for future risk. Miller was subsequently awarded the 1990 Nobel Prize in Economic Sciences, which he shared with Markowitz and Sharpe.

In their first paper the authors took an economic view which considered the behaviour of all participants in the economy, specifically firms, shareholders and bondholders. Plus there were a number of simplifying assumptions including that all market participants had the same information and the same expectations around future

profitability, all market prices for identical assets were the same and therefore readily substitutable, there were no transaction costs, no taxes, and firms could be simply categorised by their expected future profits and risks such that they were perfect substitutes for each other thereby allowing frictionless arbitrage by investors between different companies (Modigliani and Miller 1958). The authors asserted their purpose in making these unrealistic assumptions was to focus on the puzzle of the uncertainty of future returns similar to a scientist studying one variable in ideal laboratory conditions.

Under these assumptions Modigliani and Miller produced their Proposition I: “the market value of any firm is independent of its capital structure” (Modigliani and Miller 1958 page 268). Therefore the cost of capital for firms in the same risk class was identical irrespective of how much leverage they had. This is because in a frictionless, perfect market investors could either create or cancel out leverage on their own account. Any market value differences which arose between firms would be corrected through arbitrage as overvalued shares or bonds were sold and undervalued shares or bonds were bought thereby eliminating any price differentials. It seems to me that the critical assumption of market rationality was contained in the words “investors can secure a more efficient portfolio by switching from relatively overvalued to relatively undervalued firms” (Modigliani and Miller 1963). The assumption of market rationality implied that market forces would quickly correct any valuation imbalances and bring all companies back into “equilibrium”, another word often used by the authors. What Modigliani and Miller did not supply was an exposition of how effectively or how quickly markets arbitrage away valuation anomalies. This would be supplied later by Fama’s (1970) Efficient Market Hypothesis. Nor did Modigliani and Miller explain how market participants should evaluate and ideally compute each firm’s risk. This would also come later in the form of the Capital Asset Pricing Model (Sharpe 1964).

Their Proposition II was that the expected return on a share was equal to that which would arise if the firm were 100% equity-financed plus a premium reflecting the financial risk and higher cost of leverage. Interestingly when the authors temporarily relaxed the no-tax assumption they still concluded initially that the value of the firm

was unaffected, despite the fact that interest on debt is tax deductible thereby potentially making it a cheaper source of finance. This turned out to be a mathematical error which was subsequently corrected in their 1963 paper.

Their Proposition III was that a firm ought only to exploit an investment opportunity if its expected rate of return exceeded its cost of capital, irrespective of how the investment was financed. The implication was that new investments would damage shareholder capital if returns, even if positive, were less than the cost of capital. This important concept underlies the later development of the Capital Asset Pricing Model (Sharpe 1964) and Economic Value Added (Stern *et al* 2001).

An unwritten assumption in the 1958 and 1963 papers would appear to be that debt was always available to both firms and individuals and at the same market rate. The perfect frictionless world of Modigliani and Miller does not reflect reality and does not accommodate a credit crunch where debt availability is restricted.

Taking Modigliani and Miller's two papers to their logical conclusion firms should borrow as much as possible in order to maximise the value of the firm to shareholders. However the authors caveat this approach in their conclusion:

“It may be useful to remind readers once again that the existence of a tax advantage for debt financing – even the larger advantage of the corrected version – does not necessarily mean that corporations should at all times seek to use the maximum possible amount of debt in their capital structures”  
(Modigliani and Miller 1963 page 442).

The reason they provide for this logic contradiction is telling:

“there are, as we pointed out, limitations imposed by lenders, as well as many other dimensions (and kinds of costs) in real- world problems of financial strategy which are not fully comprehended within the framework of static equilibrium models, either our own or those of the traditional variety”  
(Modigliani and Miller 1963 page 442).

So if the authors' analysis does not fully comprehend the real-world, in what sense is it useful to the practitioner? Well, previously firm value had only been considered in a



rudimentary way typically by capitalising expected future after tax cash flows and making subjective adjustments for risk associated with debt. Modigliani and Miller (1958, 1963) have provided theoretical insights into the efficiency with which capital is deployed.

### **1988 – Miller’s reflections on Modigliani and Miller 30 years later**

In reflecting 30 years later Miller argued that even with the unrealistic assumptions about a frictionless world, Propositions I and II advanced the rigour with which firms were valued which in turn has aided market efficiency (Miller 1988). Despite their laboratory of unrealistic assumptions, Miller argued he and Modigliani were right to identify the cost of capital, future expected cash flows, leverage, tax, and risk as determinants of firm value. Furthermore they also showed how these determinants could be manipulated and discounted meaningfully as a preliminary step before introducing real-world constraints.

Miller (1988) tacitly conceded the validity of subsequent criticisms around market rationality and the added risk associated with leverage. In particular he drew attention to the information asymmetry of the agency problem, namely that inside management and outside shareholders do not have the same information about a firm’s future expected cash flows and therefore would not use the same data when computing firm value. This meant announcements about dividend intentions were an important signal on what inside management knew. What Miller did not say is that the informational content of dividend announcements could also be abused by management to give shareholders an incorrect signal as to future cash flows as we see in the case studies on Aero Inventory and Woolworths in Chapter 5.

In this reflection Miller was also more transparent on the logical conclusion of the 1963 paper:

“Under conditions which can by no means be dismissed out of hand as implausible, we showed that the value of the private claims might well have no well-defined interior maximum. The optimal capital structure might be all debt!” Miller (1988 page 190).

In the real-world over the past fifty years since Modigliani and Miller's propositions, few major companies have adopted this extreme capital structure. However high leverage is a strategy adopted by some companies, including two I have been associated with in my professional career as outlined in my DPS4520, DPS4060 and DPS5120 submissions. We see high leverage also in the bank case studies in Chapter 5. From my own experiential learning I can confirm high-leverage companies seem to suffer from a vulnerability to bankruptcy. This could be taken to suggest that Modigliani and Miller's recommendation of high leverage in their idealised theoretical world was in fact wrong when weighed against actual market experience.

A particularly interesting example of that strategy was to follow after this paper was written, Long-Term Capital Management, which will be considered as part of the risk literature.

### **“How do we control risk?”**

Returning to the third thought bubble of the Figure 2 mind-map, much of the literature considered up to this point has included implicit consideration of risk. Here we turn to literature which focuses explicitly on the topic of risk.

### **1964 – Hertz's risk analysis in capital investment**

Hertz (1964) identified a weakness of mathematical models in that they often rely on a single measure of expected future return or expected risk. Hertz argued that the problem with this approach was that it can over-simplify the variability of these subjective estimates. Improved decision-making can be achieved by considering the distribution of expectations about the future rather than a single average viewpoint. What Hertz shows is that risk is best described as a probable range of values rather than a single expected value. Later in the literature we see risk described as a probability distribution.

Published in the same year as Hertz (1964), Sharpe (1964) took a very different approach to describing risk.

## 1964 – Sharpe’s Capital Asset Pricing Model pros and cons

What was to become known as the Capital Asset Pricing Model had an interesting origin: it appears to have been independently developed at approximately the same time by William Sharpe, John Lintner and Jan Mossin in the mid 1960s. It is worth noting that one of Sharpe’s mentors was Harry Markowitz himself (Sharpe 1964), and Sharpe’s paper draws heavily, and I would suggest uncritically, upon Markowitz’s methodology.

Implicit within Markowitz’s findings was the concept of asset risk and the consequent need to assemble a diversified portfolio of minimally correlated securities in order to produce an optimum overall return. In order to achieve a higher return, higher risk had to be borne. But the relationship of risk to an asset’s price was not defined. Although by the 1960’s the concept of a risk premium above the risk free rate of return was already acknowledged (for example Modigliani and Miller 1963), Sharpe’s paper addressed the need for considering total risk and its components.

Sharpe (1964) began by defining the likely aim of a rational investor as being the maximisation of expected future return. As expectations about the future were subject to uncertainty, Sharpe assumed the investor would consider the expected future standard deviation of an asset when making an investment decision. Therefore the rational investor would seek the highest expected future return with the lowest expected future standard deviation. Such an investment or portfolio of investments was “efficient” (Markowitz 1952); and any investment or portfolio with a lower expected return and/or higher expected standard deviation would be inefficient.

I consider there were some embedded complexities here which Sharpe did not make explicit. Expected future returns, expected future standard deviation and future correlation between assets in a portfolio all related to unknowable future behaviour. Those variables were incalculable and could only be estimated, most likely in terms of a probability distribution. The formulas of expected future returns and standard deviation put forward by Sharpe (1964) presumed that the investor’s expectations were accurate mathematical inputs. Of course, that presumption would depend upon how well informed the investor was about the future, which was a function of the

investor's intellect, experience, how much research they had done, what time horizon was intended by "future", and the chaotic interplay of future risks such as the occurrence of macroeconomic events. With such unknowns surrounding the reliability of inputs into Sharpe's equations, I suggest we cannot be confident that the outputs will reflect the optimum portfolio.

Sharpe (1964 page 433) invoked two further assumptions: (1) a pure, risk-free rate of interest at which investors could either borrow or lend; and (2) homogeneity of investor expectations. Once again these assumptions are open to challenge. In the real-world, investors will always pay a premium over the risk-free rate and the quantum of borrowings will be limited to the bank's risk appetite not the investor's. Additionally investor expectations are not homogenous but will reflect risk appetite, differing expectations about the same asset's future performance, qualitative preferences (such as aversion towards environmentally-unfriendly investments), age, starting wealth (Bernoulli 1738), personal tax circumstances and time horizon.

Sharpe (1964) then took his readers into a deeper understanding of risk. The risk of an individual asset was comprised of an element which could be diversified away in a portfolio such that one asset's under-performance could be offset by another asset's over-performance; and an element which could not be diversified away as all assets in the portfolio are subject to the same overall macroeconomic factors. I found it helpful to think about this in terms of an index fund of the entire market, say the UK FTSE all-share. The overall expected return from such an index fund will approximate the overall market return, with some companies performing above expectations while others perform below expectations. So the index fund will produce a covariance of one with the FTSE all-share market. However the market as a whole will be affected by macroeconomic factors which will have an impact on returns which cannot be diversified away.

Sharpe went on to develop what is now called the Capital Asset Pricing Model formula:

Return on an individual asset = risk-free rate of return + (the individual asset's beta x market risk premium)

Or in mathematical notation:

$$r_a = r_f + \beta_a(r_m - r_f)$$

where

$r_a$  = the expected return on an individual asset

$r_f$  = the risk-free rate of return (typically the return on government bonds)

$r_m$  = expected market return

$\beta_a$  = a measure of the individual asset's risk

The formula for an individual asset's  $\beta$  is:

$$\beta_a = \text{covariance}(r_a, r_m) / \text{variance}(r_a)$$

And this is calculated with reference to the price performance of the asset over a historic period of time decided upon by the investor and its covariance with the market return over the same historic period. Because it computes covariance with the market as a whole, beta ( $\beta$ ) reflects the diversifiable risk associated with an individual asset, not the overall market risk. That is, whether the market goes up or down is irrelevant to the asset's beta. Beta measures the historic covariance of the individual asset against the market.

There are a number of objections to this model in the literature, most clearly spelled out by Buffett (1977-2012) who rejected the Capital Asset Pricing Model's approach to beta in the following words:

“the academics' interpretation of risk is far off the mark, so much so that it produces absurdities. For example, under beta based theory, a stock that has dropped very sharply compared to the market ... becomes riskier at the lower price than it was at the higher price ... In assessing risk, a beta purist will disdain examining what a company produces, what its competitors are doing, or how much borrowed money the business employs. What he treasures is the price history of its stock” (Buffett 1993 letter to shareholders).

Furthermore the assumptions inside which the theory is framed, such as zero transaction costs and zero taxes, do not reflect market reality as is common across all the Modern Portfolio Theory literature and as acknowledged by Sharpe himself.

### 1992 – Fama and French arguments against beta

Beta also has detractors in the academic community such as Modern Portfolio Theorists Fama and French (1992) who objected to estimating an asset's future risk by reference to historic price data and also without reference to the asset's fundamental characteristics.

Fama and French (1992) cite a number of studies showing that size matters when it comes to the riskiness of returns. They found that average returns on small companies are too high given their beta estimates and vice versa average returns on large companies are too low. In other words beta, which is calculated exclusively from historic price data, does not consistently predict the volatility of returns. Nor does beta capture the added risk and return arising from leverage. Furthermore, Fama and French point out that return volatility is also related to the market to book ratio and to the price-to-earnings ratio, both of which are derived from accounting data.

“In a nutshell, market beta seems to have no role in explaining the average returns on NYSE, AMEX and NASDAQ stocks” (Fama and French 1992 page 445).

They conclude that “in short, our tests do not support the central prediction of the [Capital Asset Pricing] model, that average stock returns are positively related to market beta” (Fama and French 1992 page 449). On the other hand “our preliminary work on economic fundamentals suggests that high- $\frac{\text{Book Equity}}{\text{Market Equity}}$  firms tend to be persistently poor earners relative to low- $\frac{\text{Book Equity}}{\text{Market Equity}}$  firms” (Fama and French 1992 page 452).

What is surprising about Fama and French's 1992 paper is that it links return volatility to accounting data for earnings and net book value rather than exclusively to market prices. The implication is that accounting data is in fact relevant when assessing risk and expected future returns. Until this paper all the literature I had reviewed on

Modern Portfolio Theory gave precedence to market data with accounting data featuring only incidentally or not at all.

To my mind this highlights an important theme that runs through most of the academic literature on Modern Portfolio Theory since Markowitz (1952): great faith is placed in the predictive power of historic price data. The reasoning appears circular: *historic* market prices are assumed to be informationally efficient under the Efficient Market Hypothesis (Fama 1970, Malkiel 2006) so they can be relied on to calculate risk (Sharpe 1964) in allocating financial capital with expected *future* minimal standard deviation.

I would add that it seems ironic that beta is calculated from past actual price data, whereas the fundamental premise of Efficient Market Hypothesis is that past price data has followed, and will continue to follow, a random walk (Fama 1965) upon which no rational decision can be based. Suddenly when it comes to beta, Modern Portfolio Theorists attribute a great deal of meaning to random price data.

### **1966 – Mandelbrot’s criticism of reliance on the Gaussian distribution**

Mandelbrot (1966) challenged the validity of the Gaussian distribution, commonly known as the normal distribution or bell-curve. He argued that while the Gaussian distribution illustrated a high incidence of small changes and a rarity of large positive or negative changes, that in the real-world large price changes were more frequent than the Gaussian distribution would suggest. While a Gaussian distribution may apply during periods of calm, the histogram needed to be modified to show a large bell with erratic tails to account for wars, natural disasters, bubbles, crashes and so forth. “Actually, it turns out that the Gaussian estimates of the probability of ruin are absurdly low, and that stop-loss devices are often inapplicable when needed most” (Mandelbrot 1966). Mandelbrot therefore recommended separately estimating the risk of extreme events.

In my own reflections and research on this in collaboration with statistician Dr David Alexander of the Australian CSIRO I have come to realise that by challenging the validity of the Gaussian distribution, Mandelbrot was really challenging the entire statistical infrastructure upon which Modern Portfolio Theory was based. Markowitz’s

original paper in 1952 and subsequent Modern Portfolio Theorists have relied upon statistical formulae such as standard deviation and co-variance which only really have relevance when analysing data which conforms to a normal distribution, which Mandelbrot would argue is often not the case in finance.

Mandelbrot later collaborated with Taleb (Mandelbrot and Taleb 2005). Taleb's idea about risk, that it could be fundamentally unpredictable, were expounded in Taleb (2007).

### 2007 – Taleb's "black swans"

Former derivatives trader now turned academic, Nassim Nicholas Taleb appeared frequently in the literature review as his book *The Black Swan* has implications for capital allocation risks. Taleb (2007) elaborated on the impact of highly improbable events which were incapable of being mathematically modelled on the basis of past data. The concept behind the book's title is an anecdote in Popper (1959) that the unexpected discovery of black swans in Australia immediately disproved a centuries-old belief that all swans were white.

With the market turbulence of the dot-com bubble and bust, and the high profile failures of LTCM and Enron, arguably somebody had to write this book. Taleb (2007) provides the interesting example of a Las Vegas casino which had shown him their sophisticated probability models and surveillance systems to spot cheaters: "I felt transported into a James Bond movie" (page 129). Yet despite the calculation of gambling odds favouring the house and extensive CCTV surveillance, the casino's largest losses had arisen from the maiming of an irreplaceable performer in their main show by a presumably tamed tiger, a bomb threat by a disgruntled contractor, a tax violation which nearly cost the casino its licence to operate, and the loss of a kidnap ransom for the casino owner's daughter. When we transfer this kind of outside-the-box thinking to equity markets or property markets or individual businesses it is not too difficult to think of past events that took markets completely by surprise, adding credence to Taleb's argument. The Global Financial Crisis, for instance, took place *after* Taleb's book was published.



An implication of Taleb's observation about the ability of one disconfirming observation to nullify many confirming observations is what Popper (1959) referred to as epistemic asymmetry. Financial markets are prone to this kind of error, with analysts frequently joining the dots of GDP, CPI, interest rates, currency movements, share price movements and so forth to infer causation and use that to predict the future.

An example of this kind of behaviour emerged on a client assignment during this research where the analytical methodology of a reputable global ratings agency used the prior four years' financial results of each company it rated (being every major company in the world) to predict the next ten years' results. Not only that, the model they used contained arithmetic errors. This client assignment provided a clue as to how the Global Financial Crisis arrived without forewarning by the ratings agencies.

But are these events really black swans? Even during my own career corporate collapses and financial crises have come and gone with a degree of regularity. As used by Popper (1959) a black swan should be completely beyond prediction, like an asteroid strike or the Second Coming of Christ. The examples discussed by Taleb (2007) – economic cycles and corporate collapses – are the types of risks to which the capital allocator needs to be alert.

Having considered the intellectual arguments about what risk is and how best to estimate or measure it, it helps to review and hopefully draw lessons from the spectacular corporate collapses of recent years.

### **1998 – The failure of Long-Term Capital Management (LTCM)**

My main source here is Lowenstein (2001) unless otherwise stated. LTCM was a hedge fund run by John Meriwether formerly of Salomon Brothers with Nobel Prize winning Harvard professors Myron Scholes and Robert Merton and former US Federal Reserve vice-chairman David Mullins as partners. With a high degree of trust owing to the extraordinary calibre of its partners, LTCM attracted significant investor funds and bank loans and could trade on favourable terms. After amassing \$140 billion in assets and \$1 trillion in underlying derivatives it collapsed in 1998.

LTCM specialised in investing in mis-priced securities, mainly bonds. Unlike many securities bonds have a high degree of parametric certainty – such as coupon rate, maturity date, redemption amount – and therefore lend themselves to mathematical modelling. So when LTCM judged that a bond had been mis-priced in different markets, even if only by a small amount, it invested heavily. The main strategy was to invest in the same bond or equity where it was listed on two exchanges at slightly different prices: the cheaper security would be purchased and the dearer security would be shorted until the difference was eliminated and the positions could be reversed at a profit.

Although profits on individual securities were small they were magnified through leverage, with those borrowings coming from the major US investment banks including Goldman Sachs, Merrill Lynch, JP Morgan, Bear Stearns and Lehman Brothers; and foreign investment banks including Union Bank of Switzerland (UBS), Barclays, Bank of Taiwan and Singapore Investment Corporation. An interesting feature of its leverage arrangements was that it could use its assets as collateral to borrow up to 100% of their value. On the new assets acquired, it could then use those as collateral for further borrowing. In this way its borrowings could cascade to levels unachievable by most companies or individuals. “In theory it could leverage itself to infinity” (Shirreff 2004).

As the fund expanded it had to move away from US bond markets into foreign bond markets (thereby engaging currency risks) and into foreign equities (a less mathematically precise type of security) and even emerging markets.

When Russia defaulted on its government bonds, bond spreads widened making it impossible for LTCM to close out its positions profitably and triggering margin calls on its loans as collateral values declined (Lowenstein 2001). This shows the weakness of estimating risk using beta based on historic market prices as recommended by Sharpe (1964): if an unprecedented macroeconomic event occurs then beta based on historic data is irrelevant.

Leverage magnified LTCM’s problems: at the very moment the value of its assets declined LTCM had to meet margin calls on its debts. LTCM argued that the markets

would in time right themselves and LTCM's trades would return to profit. But the borrowing arrangements did not allow for an uncertain period of time to wait for the market to correct itself, particularly once counterparties had lost confidence in LTCM's strategy (Lowenstein 2001). Knowing it was under pressure to sell investments to meet margin calls and buy back its short positions, other firms took advantage and offered harsh terms to LTCM, including a bid to buy the under-priced assets by Warren Buffett, AIG and Goldman Sachs (Lowenstein 2001). This is the first time I found in the literature Goldman Sachs playing a seemingly duplicitous role<sup>13</sup>, but I encountered this suspicion again later (Arlidge 2010).

The US and non-US investment banks risked not being paid the significant loans they had extended to LTCM, which in turn presented a mini Global Financial Crisis of bank collapses causing the US Federal Reserve to facilitate, but not underwrite, a rescue deal in which the investment banks became LTCM's managers during a period of orderly wind-down (Lowenstein 2001). That the investment banks became so vulnerable to large losses suggests they had incorrectly evaluated the risks LTCM were taking, perhaps due to the complexity of LTCM's strategy and the distinguished quality of their partners. Had the US Federal Reserve not facilitated this deal, a fire-sale of LTCM's assets might have occurred, the investment banks would have taken a "haircut"<sup>14</sup> on their loans which in turn may have bankrupted some of them, which in turn may have led to more fire sales within their wholesale funding supply chains.

LTCM is particularly instructive about risk:

- It was another reminder of the danger of leverage.
- The financial world learned that markets do not lend themselves to mathematical precision, even when the calculations are done by Nobel Prize-winners.
- The 1998 Russian default should not have come as such a surprise. Spread widening in bond markets is not unheard of. A few years earlier in 1997 there

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<sup>13</sup> Lest I get into trouble I hasten to add Goldman Sachs sees its role as helping companies to grow and denies any unethical behaviour stating that Chinese Walls backed by electronic security prevent information from being misused internally (Arlidge 2010).

<sup>14</sup> "Haircut" is the term used when bondholders reluctantly agree to accept a redemption amount that is less than the capital originally invested.

had been a banking crisis in the Far East, known as the Asian Financial Crisis (Krugman 2000).

- In this case LTCM had failed to understand the inter-connectedness of risk. The widening of bond spreads had created a temporary loss situation, but it was magnified by margin calls owing to LTCM's high level of debt, and there were no funds with which to meet the sudden rush of margin calls owing to the partners' own personal indebtedness.

Subsequently LTCM partner Scholes went on to create a new fund Platinum Grove Asset Management LP which ran into difficulties as a result of the Global Financial Crisis (Smithson and Simkins 2009).

In an interview Scholes made the interesting and apparently self-defeating observation that:

“Risk management systems tell you how to think about risk and manage risk. But if you have extreme events such as those that occurred subsequent from 2007 through 2008 (particularly with the collapse of the world financial system) it would be very hard to build any risk management system that would protect any entity against the shocks that were experienced at that time, unless your risk management system said you are always 100 percent in cash” (Smithson and Simkins 2009 page 130).

He went on to say the extent of the crisis and the subsequent government intervention were beyond his expectations. But surely that is the point: mathematical models are limited by the expectational inputs of their creators, who are limited by past data, past experiences and cannot envisage all possible future outcomes.

Scholes was adamant that the financial models themselves were not flawed (Smithson and Simkins 2009). As Professor of Finance Emeritus at the Stanford University Graduate School of Business and Nobel Prize-winner his defence of theoretical mathematical models is understandable but not excusable. Having taken financial models out of the academic world and applied them in the business world twice with disastrous consequences on both occasions, I would have hoped Scholes would have

offered more insights. Again in his own words: “Models did work. I think we have to distinguish modelling from inputs to models. It might be that the inputs to models are incorrect” (Smithson and Simkins 2009 page 131). Practitioners call this GIGO (“garbage in garbage out”).

By this stage in the literature review I had less residual faith in mathematical models than Scholes evidently retains. Mathematics is one tool for the financial capital allocator, but it needs to be used with care both as to model design and model inputs.

### **2001 – The failure of Enron**

As a consultant in Ernst & Young’s Energy Practice in the late 1990s where my clients included British Petroleum and Kuwait Oil Corporation, Enron was seen by us at that time as a particularly innovative energy company with a skill in making superior profits through creative and mysterious energy trading. The spectacular and swift demise of Enron in 2001 was a shock to those of us working in the sector at that time.

In Watkins (2003) the author describes her experience as an Enron insider. Watkins was a portfolio manager at Enron who had warned management, both in writing and face-to-face, of accounting anomalies prior to the company’s highly publicised failure in 2001. Although ignored by management, she subsequently received numerous awards including Time Magazine Person of the Year for 2002 (Watkins 2003).

Watkins revealed Enron’s problems derived primarily from a partnership, LJM, which transacted with Enron and was also controlled by Enron’s chief financial officer thereby creating a conflict of interest. Enron had hedged the value of its high technology investments with LJM. “Basically Enron was hedging with itself” (Watkins 2003 page 121). When those technology investments lost most of their value in the hi-tech crash of 2001, LJM owed Enron several hundred million dollars due to having hedged those investments. As LJM did not have sufficient capitalisation to sustain such huge losses on its hedges, the losses bounced back to Enron but Enron declined to account for them. When Watkins discovered this she raised it with Enron’s then chief executive Kenneth Lay.

By the time those hedges were unwound only a matter of weeks later, Enron had lost \$1.2 billion and was bankrupt (Watkins 2003).

Watkins expressed bitterness that 5,000 employees were summoned to a meeting at which they were told to pack up their belongings and go home. There was no warning, no counselling, and no severance pay, except for 25 executives who were rewarded with \$55 million to stay on to manage the wind down (Watkins 2003).

Chanos (2002) provided a similar account as an outside short seller of Enron. Chanos had identified numerous accounting and business model inadequacies that provided him with conviction that Enron's accounts were opaque and fraudulent. Subsequent events proved Chanos' suspicions were correct, which favoured his short-selling position in Enron.

The fall-out of Enron's collapse also included the sudden demise of esteemed audit firm Arthur Andersen who had provided both internal and external audit services to Enron and who commenced shredding their own working papers once the accounting anomalies came to light (Watkins 2003). Internal audit, which should assist with minimising these kinds of disasters, seems conspicuously absent from the literature. Internal audit has proved less effective than might be hoped due to ambiguities in its organisational positioning and the internal audit profession's own confusion as to what its role needs to be (Lenz and Sarens 2012). While Andersen had provided both external audit and internal audit services to Enron, my employer Ernst & Young had provided both external and internal audit services to British Petroleum, where I had worked as part of the internal audit team. Following the events around Enron and Andersen, Ernst & Young promptly resigned as BP's internal auditor.

Watkins also points out that in setting up the LJM partnership Enron received very poor advice from its lawyers and investment bankers. The external auditors and internal auditors failed to spot the irregularities, both services having been provided by Andersen in contravention of good audit practice. The catalogue of failure both by Enron and firms it was in business with resulted in the 2002 Sarbanes-Oxley Act requiring directors to assume criminal liability for financial mis-reporting.

The fraud was that Enron had created an external related party entity in which losses could be temporarily hidden. The hedges created the delusion that those losses would be recovered. With normal market behaviour the hedges would have oscillated in and out of loss. But once the high tech companies permanently lost their value the counterparty, LJM, did not have sufficient capitalisation to sustain losses of that magnitude. Accounting fraud remains a risk to which the capital allocator needs to remain alert (Chanos 2002).

### **2007 – The failure of Northern Rock**

The riddle pointed out in D’Arcy (2010) is that Northern Rock offered mortgages at 125% of value to poor credit borrowers without the need to certify their earnings. Yet these favourable terms were offered at interest rates which were so competitive that Northern Rock took market share from competitors. Intuitively this should have resulted in Northern Rock experiencing higher arrears than its competitors, yet this was not the case according to Northern Rock’s financial reports (D’Arcy 2010).

The solving of the riddle came when a UK Financial Services Authority investigation revealed that executives at Northern Rock had mis-reported the extent of mortgage arrears (D’Arcy 2010). Northern Rock executives had hoped the arrears were a temporary problem which would be remedied over time. This strikes me as awfully similar to the situations at LTCM and Enron where executives had similar optimistic hopes about the future.

Northern Rock added the arrears back to mortgage balances thereby accounting for the arrears as loan assets rather than providing for them as impairments (D’Arcy 2010). As an accountant I would suggest this would have been identifiable through the divergence of a ballooning mortgage asset and declining cash inflows from mortgagees. What destroyed Northern Rock was that their long term loan assets were funded by short term wholesale borrowing which dried up in the 2007 Credit Crunch (D’Arcy 2010). They had not matched the timing of their assets and liabilities.

This demonstrates the importance of not only studying reported financial statements for unexpected financial divergences but also reflecting on market behaviour and even advertising to spot potential anomalies. D’Arcy (2010) does not mention it but

Northern Rock's reckless lending behaviour forced competitors, such as Halifax Bank of Scotland, to behave similarly. That it was public knowledge that Northern Rock and others were advertising mortgages at unprecedented high loan-to-value ratios and sometimes on a 'self-certified' basis makes it remarkable that the Global Financial Crisis came as a surprise at all.

### **2007 – The Global Financial Crisis**

Joseph Stiglitz is a Columbia University professor, Nobel Prize-winner and former World Bank chief economist, so his views on the Global Financial Crisis are of interest.

He points out that prior to the Crisis banks were highly leveraged at around 90% meaning even a small decline in asset values would wipe out capital adequacy (Stiglitz 2010). From my own knowledge as a consultant a high level of leverage is normal for banks – they borrow small amounts of capital from a large number of depositors at low or zero rates of interest and lend it back out to borrowers at high rates of interest. Their key skill is in being able to minimise bad debts on their loan book through good risk management.

But Stiglitz (2010) points out that good risk management is what the banks failed to do. They not only loaned to uncreditworthy borrowers due to distortions arising from their compensation incentives (also Woolley 2010), but they also found ways to hide the risks that were being taken by repackaging poor underlying loan books into securities which were rated highly by the credit rating agencies. Short term performance targets were being achieved by taking on more risk rather than through genuine outperformance.

Instead of performing its key role of managing risk and assisting in the allocation of capital at minimum cost the sector achieved the opposite.

Taking Stiglitz's paper, there are lessons for the capital allocator. The availability of credit on acceptable terms is not guaranteed. Borrowings may need to be repaid at an inopportune moment or may not be available when needed. Capital allocation strategies which rely on leverage – which many seem to – is a risky approach. I analyse this further in the Chapter 5 case studies and in particular through detailed



analysis of the historic results of Lloyds Bank and the Royal Bank of Scotland before and during the Global Financial Crisis.

### **2009 – Lessons from the Madoff fraud**

Bernard L Madoff Investment Securities LLC was a hedge fund which fell into difficulties and used new incoming investor funds to pay out redemptions to existing investors. It collapsed when incoming investor funds were insufficient to meet redemptions, resulting in losses of around \$50 billion (Gregoriou 2009).

Madoff's promise was to achieve 8-12% gross annual returns irrespective of what the stock market did. He claimed to have engineered this through options which created ceilings and floors on his equity holdings which would trigger if the price deviated up or down by more than the option collar. This gave the appearance of reliable long term returns. The reality appears to be that no such fool-proof system was in place.

Madoff's way of structuring his funds was to disconnect clients from his company through the use of multiple intermediate brokerages. Gregoriou (2009) claims this opaque structure was essential to Madoff's ability to keep his true activities hidden from view.

Gregoriou (2009) draws attention to the fact that the feeder brokerages were not permitted to disclose Madoff's name nor that of his firm to client investors. The ethics of managing other peoples' money require transparency whereas Madoff appears to have created a structure that allowed secrecy. Further, the fund was audited by an obscure single partner accounting firm, which was inappropriate given the amount Madoff was managing (Gregoriou 2009).

I do not entirely agree with Gregoriou that diligent investors would have spotted the "red flags". Madoff appears to have effectively shielded his activities behind reputable brokerages thus creating an appearance of safety. In fact it is not unusual for funds to be managed in secret. Hedge funds sometimes adopt legal structures that do not require detailed disclosure of their activities such as limited liability partnerships. The desire for secrecy highlights the need for thorough due diligence before allocating

capital and this is reflected in the Strauss and Corbin (1998) approach to case study analysis.

### **2010 – Emmanuel, Harris and Komakech on management bias**

Emmanuel *et al* (2010) analysed capital investment decisions through the lens of psychology, so I could arguably have categorized this paper within the behavioural finance literature. In fact the authors did cite some of the academics I had read as part of the behavioural finance literature review such as Thaler, DeBondt and Kahenman. However it was the authors' findings on the significance of cognitive bias risk that suggested a better fit within this section of the literature review.

Emmanuel *et al* (2010) analysed the influence of cognitive factors at various stages of the capital investment decision life cycle mostly in off-market capital investment transactions. Therefore this paper provided a useful perspective from inside companies. In their findings they observed the interplay of managerial cognitive factors, such as heuristics based on industry experience, memory of similar transactions, positive/negative framing of the capital allocation proposition, “group-think” by in-group management “cocoon”, and political behaviour between senior and junior management levels could vary significantly from company to company depending on organisational culture and the existence or otherwise of policies and processes relating to capital investment decision-making. What appeared common through both their literature review and their own case studies was the primacy of management behavioural factors and risk assessment over mathematical analysis of the opportunity itself.

While formal risk assessment was a usual step in the capital investment processes observed by the authors, this normally took the form of qualitative risk assessment done in consultation with outside stakeholders. What appeared absent from the paper's findings was much evidence that management were analysing opportunities other than judgementally. If this is so, then it may explain the authors' observation that there had been no clear link between “sophisticated investment appraisal techniques” and “improvement in corporate performance” (Emmanuel *et al* 2010 page 478). This is relevant to my research questions which aim to address what might be a

shortcoming in “sophisticated investment appraisal techniques” both in terms of appraisal of returns and risk appraisal.

### **2011 – Risks around accounting information**

Much of the information on which capital allocation decisions are made by practitioners is sourced from published accounting data. However accounting data is vulnerable to distortions around the selection of accounting policies, judgements around revenue recognition, capitalisation of expenses on the balance sheet instead of expensing through the income statement, the choice of depreciation/amortisation rates, provisioning or non-provisioning for the collectability of debts, reserving for future liabilities, transaction timing and so forth. In the literature this is variously referred to as creative accounting (Griffiths 1992, Sherman and Young 2001, Eckersall 2009, Athanasakou *et al* 2011) or earnings management (Nelson *et al* 2002, Johnson 2009). Management’s motives can range from inflation of earnings to meet compensation targets, deflation of current year earnings to meet future targets, job preservation, meeting analyst expectations (Athanasakou *et al* 2009), management ego and so forth (Johnson 2009).

Again I can draw upon my own experiences here where in 2006 my then boss, the chief financial officer of a large privately owned company, confided in me that he had been told by the chief executive officer that no matter what the reality might be, “he was not prepared to be the CEO of a loss-making company”. Despite the fact the company was loss-making and cash flow negative, the accountants were instructed to capitalise expenses onto the balance sheet as assets in order to show an accounting profit. I resigned as head of internal audit and the company was bankrupt within two years. Buffett (2002) describes succinctly the behavioural pattern of earnings management: “Managers that always promise to ‘make the numbers’ will at some point be tempted to make up the numbers”.

The independent role of external audit should reduce the likelihood of creative accounting, but worryingly for the aims of this research and again consistent with my workplace experiences, Nelson *et al* (2002) found that auditors are more likely to adjust creative accounting at their smaller clients and less likely to do so at their larger

clients, suggesting an unhealthy power relationship between large companies and their auditors. Creative accounting/earnings management therefore amplify the epistemic risks underlying this project's research.

With more than two decades' experience since qualifying as a chartered accountant during which I have worked as both a preparer of accounting data and as an auditor at Ernst & Young, I am aware of the risks of accounting information and the caveats around the work of professional auditors. These risks include the ability for management to use considerable judgement in how data is presented, the inclusion of bias through highlighting data which is favourable to management while obscuring unfavourable data in the notes and so forth. I am also experientially aware that creative accounting/earnings management has a drawback: while it can succeed in obscuring true financial information over one or two years, it becomes increasingly difficult to sustain over longer periods. Eventually reality – most obviously cash flow or a change in management – catches up with the creative accountant.

For the purposes of this research, the vulnerabilities of accounting data represent a significant epistemic risk which will be taken into account in the research through the following measures:

- Detailed case study microanalysis (Strauss and Corbin 1998) including the use of notes and “fine print” which could be used to conceal relevant information.
- Various methods of triangulation including internal consistency between qualitative information, accounting data and cash flow data.
- Analysis of several years' data to minimise the risk of ongoing creative accounting practices.

### **CRITICAL REFLECTION: Research questions: Literature review**

The literature review has provided partial answers to the research questions.

<p>1. Through critical literature review and discussion with relevant practitioners determine what techniques are available to capital allocators when making capital allocation decisions with a view to describing a prioritised hierarchy of distinctive capital allocation criteria and/or filters.</p>
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As a reflective practitioner I can now look back on the literature in the light of over two decades' experience, something I was not able to do as an undergraduate. The literature review proved to be a catalyst for reflection which challenged most of what I was taught as an undergraduate and even more recently as a corporate finance student at London Business School (DPS4040). Academic theories and quantitative models advanced since Markowitz (1952) have dominated capital allocation decision-making for several decades despite the fact they were often devised inside theoretical laboratories where there were no taxes, no transaction costs, debt was in unlimited supply, and the future was assumed to be mathematically identical to the past. In nearly all of the academic literature the authors pointed out the real-world limitations of their models yet these caveats appear to have bypassed business education, at least in my experience. The models were never described in a way that encouraged cut-and-paste into real-world situations. Indeed reflective practitioners have taken and modified the theories, for example EVA (Stern *et al* 2001) which is an adaptation of Modigliani and Miller (1958) Proposition III.

As a finance undergraduate in the late 1980s it was the purely quantitative models of Modern Portfolio Theory that were taught and examined. Admittedly the behavioural finance literature was then undeveloped. But the reflective approaches of Graham (1976) and Buffett (1977-2012) or the mathematical challenges of Mandelbrot (1966), although well documented at that time, were not so much as mentioned in passing let alone included in the curriculum. This would seem a deficiency in my undergraduate education.

More recently the Efficient Market Hypothesis has been questioned in both academic and practitioner literature, with even Fama (1991) appearing to moderate his views. But what Efficient Market Hypothesis usefully tells us is that markets absorb information over time and adjust prices accordingly. The practitioners agree that in the long-run market prices have tended to reflect underlying value (e.g. Harris 2005). This would at least confirm that the quest to allocate capital, as envisaged in RESEARCH QUESTION 1, is worthwhile.

The behavioural finance literature argues convincingly that not only are prices not informationally efficient but that they deviate from fundamental value much of the time due to incessant bubbles, crashes and the short term incentives of financial intermediaries. By not accounting for human behaviour it would seem Efficient Market Hypothesis does not fully describe market prices at a point in time.

Therefore there is a significant difference between the approaches of a Modern Portfolio Theorist and a reflective practitioner. That there are unpredictable periodic aberrations in market prices when markets are informationally inefficient creates an opportunity for the reflective allocator to buy when prices are irrationally low and sell when prices are irrationally high. The challenge here is to distinguish the hierarchy and configuration of the most important fundamental variables.

The literature made incidental reference to the counter-intuitive strategy adopted by some practitioners of short selling (eg Graham 1976, Chanos 2002) whereby an investment is sold before it is purchased. However as an asset is first sold at a certain price, it must later be purchased at an uncertain price making the downside risk infinite as the uncertain future asset price has no upper limit. This capital allocation strategy will work if the subsequent purchase price is guaranteed to be lower than the initial sale price, as might be the case for a company known to be on the verge of bankruptcy or having committed accounting fraud. Although it is a capital allocation technique used by some in the practitioner community, the unlimited downside risk makes it inappropriate for my firm's use.

Reflecting on the highly mathematical approaches of the academic literature, I have three reservations:

1. From my own career experiences and as pointed out by Miller (Smithson and Simkins 2009), sophisticated mathematical models are vulnerable to the quality of their estimations.
2. Although market price data in the financial pages might give the appearance of homogeneity and therefore of being capable of modelling in terms of mean variance (Markowitz 1952), beta (Sharpe 1964), portfolio optimisation (Hadar

and Seo 1988, Black and Litterman 1992) and so forth, in fact the underlying businesses described by the securities are far from homogenous.

3. Although calculus is suitable for determining maxima and minima which would appear ideal for the capital allocator seeking to optimise a portfolio, calculus was designed to model physical phenomena where motion or flows are continuous rather than to financial phenomena influenced by erratic social behaviour both in the businesses themselves and in the markets in which they raise capital. Constructing algebraic formulas based on either historic data or subjective “probability beliefs” (Markowitz 1952) and then differentiating or integrating to find maxima and minima seems to place unwarranted faith both in calculus and in neoclassical economic rationality.

Taken together, these reservations suggest to me that sophisticated mathematical models are themselves an epistemic risk to the capital allocator and would therefore not be a technique envisaged by RESEARCH QUESTION 1.

If predictive estimation of the future is required then Monte Carlo would appear to be a more suitable tool for the reflective allocator as it allows explicit definition of model inputs; and rather than creating a single answer it instead generates a probability distribution showing a range of possible outcomes. Also in Monte Carlo’s favour is that it is not limited to the Gaussian distribution. Each parameter can have its own normal or non-normal distribution to reflect its real-world characteristics from which the aggregate probability distribution can be generated.

As to acquiring data inputs the reflective practitioners adopt a case study approach when seeking to optimise a portfolio of non-homogenous securities. What the practitioners do not tell us is how exactly they do this. DuPont analysis is a systematic method for investigating the contribution to earnings from margin and asset turnover (Soliman 2008). But it treats the business as a single entity by ignoring segmental data. DuPont is also limited by the omission of:

- qualitative analysis into drivers underlying margin such as innovation, brand power, exploitation of niche markets

- drivers underlying asset turnover such as efficient use of plant and equipment, inventory turnover and working capital efficiency
- metrics designed to test the reliability of accounting data
- cash flow data.

What we do know from the literature is that the practitioners (e.g. Harris 2005) place reliance on accounting data which is itself subject to estimation error and deliberate fraud. Yet under UKGAAP, USGAAP and IFRS the “earnings” figure does not fully explain the movement in shareholders’ funds due to other earnings phenomena which are reported in a supplementary earnings statement, known as the Statement of Comprehensive Income under IFRS International Accounting Standard 1. This shortcoming in the price-to-earnings ratio will be considered further in Chapter 4.

2. Through critical data analysis determine which businesses in the corporate sector have been consistently good at capital allocation throughout both good times and periods of crisis and seek disconfirming data from businesses which have been poor at capital allocation with the aim of producing a list of case study candidates for further analysis.

The literature provided a number of examples of businesses which have lost the capital entrusted to them, including LTCM, Enron, Northern Rock, Madoff Investment Securities. These provide useful findings from which we may learn valuable lessons around the dangers of debt obligations at times of business distress, and the dangers of fraudulent accounting. Any capital allocation tool designed to assist in answering RESEARCH QUESTION 1 will need to take account of these risks.

As to businesses which have been consistently good at allocating capital, by their nature they may be less susceptible to media coverage and therefore less obvious to the capital allocator except through detailed research (for example Schroeder 2008 page 828). From the literature it was evident that Berkshire Hathaway and Coca-Cola would appear to have been consistently good at allocating their capital. These will be carried forward into the Chapter 5 case studies.



As to disconfirming data, what I had in mind at the time of devising this research question was a distinction between data evidencing favourable, as opposed to unfavourable, returns on capital framed in the context of the Figure 1 Trustnet data.

4. From the above research into relevant literature and case studies, describe how the findings can be used to develop a new model which can be used to improve capital allocation decision-making and translate this into a knowledge based tool or suite of tools for use by my firm in providing value-adding client services .

Based on Emmanuel *et al* (2010), capital investment decision-making within companies, at least outside the financial services sector, gives primacy to managerial judgement, which is subject to various cognitive biases, over mathematical analysis. This was in contrast to the guru practitioners who do appear to use sophisticated opportunity and risk analysis. Both the academic and practitioner literature provided a selection of useful metrics as well as numeric benchmarks. Combining the metrics obtained from the literature with my own experiences as a finance professional, I would summarise the most useful metrics as likely to be those in the following table.

<b>Metric category</b>	<b>Examples</b>	<b>Main literature reference</b>
Asset strength	<ul style="list-style-type: none"> <li>• net asset value</li> <li>• net tangible assets</li> <li>• net current assets</li> <li>• price to book ratio</li> </ul>	Graham (1976)
Business returns	<ul style="list-style-type: none"> <li>• return on capital employed</li> <li>• return on equity</li> <li>• price-to-earnings ratio based not on a single year but on multiple years in order to capture trends</li> <li>• price to sales ratio</li> <li>• durability of product offering</li> </ul>	Graham (1976) Slater (1998) Stern, Stewart and Chew (2001) Buffett (1977-2012)

Shareholder returns	<ul style="list-style-type: none"> <li>• earnings per share</li> <li>• dividend yield per share</li> <li>• dividend growth rate</li> <li>• dividend cover</li> <li>• net asset value per share growth rate</li> <li>• number of shares purchased/issued</li> </ul>	Graham (1976) Slater (1998)
Segmental results	<ul style="list-style-type: none"> <li>• sales composition by segment</li> <li>• sales growth by segment</li> <li>• profit margin by segment</li> </ul>	Stern, Stewart and Chew (2001)
Working capital efficiency	<ul style="list-style-type: none"> <li>• debtor days</li> <li>• creditor days</li> <li>• inventory turnover</li> </ul>	Graham (1976)
Treasury efficiency	<ul style="list-style-type: none"> <li>• average interest achieved on liquid funds versus average interest paid on loans</li> <li>• average tax rate</li> </ul>	Modigliani and Miller (1958) Stern, Stewart and Chew (2001)
Risks	<ul style="list-style-type: none"> <li>• debt to equity ratio</li> <li>• interest cover</li> <li>• diversification</li> <li>• sensitivity to interest rates</li> <li>• sensitivity to negative surprises</li> <li>• sensitivity to currency movements</li> <li>• use of Monte Carlo simulation</li> </ul>	Bernoulli (1738) Graham (1976) Slater (1998) Shirreff (2004) Harris (2005) Stiglitz (2010)
Management orientation	<ul style="list-style-type: none"> <li>• percentage of shares owned by the board</li> <li>• board remuneration level</li> </ul>	Jensen and Meckling (1976) Buffett (1977-2012)

Figure 5 – Summary of metrics used in the literature

## Next steps

The literature review has usefully highlighted a number of existing and experientially-based metrics usable as a framework for the development of the Chapter 4 research tools. For the reasons outlined above I am more convinced of the arguments around imperfectly efficient markets, in which case capital allocation is not a random process capable of being done by chimpanzees (Malkiel 2006) but one which requires skilful analysis. In Chapter 3 I therefore aim to select a methodology to build a developmental financial capital allocation process as envisaged in the research questions which allows for reflexivity and continuous learning with a view to achieving incrementally improved performance beyond this project's duration.

## Chapter 3 – Methodology options and choice

### Methodological options and suitability

Much of my undergraduate training and the literature considered in Chapter 2 adopted *positivist* methodologies using mathematical techniques to isolate individual financial parameters for analysis. The kinds of mathematical analyses then carried out typically included the use of calculus to compute maxima and minima, time-series analysis for observing data relationships or the statistical extrapolation of population characteristics on the basis of an assumed representative sample. From this analysis, causal inferences could be drawn as a basis for generalised conclusions about market behaviour, financial risk, optimum capital structure and so forth.

For example Markowitz (1952) used historic individual security price co-variances to optimise the mean variance of a diversified portfolio. Fama (1965) used the market price data of individual securities to prove his random walk concept from which to formulate Efficient Market Hypothesis which is then used by Malkiel (2006) to infer logically that index funds are the best capital allocation technique. Sharpe (1964) used the co-variance between an individual security's price against the market index to compute beta. DeBondt and Thaler (1985) used the price-to-earnings ratio to assemble winner and loser portfolios using time series analysis. There were other examples using an assortment of single or limited variable mathematical analyses often excluding real-world phenomena such as taxation and transaction costs and therefore not fully contextualised in a real-world setting. Within these positivist methodologies, the Gaussian normal curve was often used to convert sample data into population generalisations, and calculus was used to optimise the particular variable being studied.

Despite this considerable amount of work over many decades, the positivist approaches of Modern Portfolio Theory remain non-predictive, in contrast, we could say, to Newton's Law of Cooling which predicts the rate at which a warm body will cool over time. In the context of allocating financial capital, the future remains subjective and unpredictable; there are no "laws" in Modern Portfolio Theory.

Opponents of the traditional methodologies included Mandelbrot (1966a, 1966b) and Taleb (2005, 2007), although neither suggested an alternative methodology to aid financial capital allocation analysis and decision-making.

By contrast the practitioners including Graham (1976), Buffett (1977-2012), Slater (1998) and Harris (2005) provided clues as to the methods and tools they had used, but were silent on methodology. Reading between the lines the practitioners appeared to be taking a case study approach.

Considering the project aims, my background and my positionality as described in Chapter 1, a flexible and exploratory methodology (Robson 2002) emerged as a suitable approach for resolving the research questions.

### **Real-world case study methodology**

As this project aims for real-world action, the use of real-world case studies is appropriate. Case studies differ from the positivist methodologies that generalise population characteristics by using data samples of predefined variables. In case study we do not start with a hypothesis, also the variables under observation are not predefined and in fact new variables may come to light during the study. I am therefore using case study as an inherently exploratory methodology.

Here I distinguish between case studies drawn directly from the real-world as opposed to those devised theoretically (even though they may be based on real-world examples). The case studies in Chapter 5 were not devised in a classroom or laboratory, but have been taken from audited financial reports lodged with the relevant stock exchanges. As a result they include many of the parameters specifically excluded from Modern Portfolio Theory literature such as taxation, transaction costs, differential borrowing/lending interest rates, accounting standards which change between jurisdictions and over time, fraudulent misrepresentation of accounting data, variable business risks and so forth thereby providing a richness of data which may be lacking in purely positivist approaches. Another advantage of real-world case study methodology is that I have been able to engage with others familiar with the cases either as outsiders or insiders. In one case I have even used my own business,

Livingwood, as a case study, where I have the advantage of intimate inside knowledge spanning ten years of establishment and management.

Professor of Planning at Denmark's Aalborg University Bent Flyvbjerg defended case study methodology in his 2011 paper. He pointed out that in social science case study is more likely to encompass context-dependent parameters that need to be considered when carrying out expert analysis: "It is only because of experience with cases that one can at all move from being a beginner to being an expert" (Flyvbjerg 2011 page 303). This is because the intensive observations of case studies are particularly good at throwing up unexpected findings which, while they can be frustrating to the researcher upon discovery, can also be a stimulant for deep reflective questioning. Dick (2002), French (2009), and McNiff and Whitehead (2010) point to the value of disconfirming data for the same reason.

In my experience case studies provide an important additional benefit: they lack boundaries. As seen in the Chapter 5 case studies, I was able to not only analyse the published qualitative and financial data going back many years, but I was also able to glean additional information from the media, academic papers, and in some cases even to question management in person. There is potentially more knowledge to be derived through real-world case study than from samples of single or limited variable numeric data, no matter how sophisticated the statistics or calculus might appear.

Real-world case studies are therefore used in Chapter 5 as part of my problem-driven approach not to prove hypotheses, as might be the case in a traditional doctorate, but to deepen my knowledge of how businesses allocate their capital in the real-world, and to use this knowledge in developing suitable tools to aid future capital allocation decision-making.

A challenge with case study methodology is the selection of cases. Flyvbjerg (2011) suggests the following dichotomy:

1. Randomly selected cases for generalisation to avoid systemic bias.
2. Paradigmatic cases that are exemplars of a larger population, which in this project could be a particular market sector.

3. Critical cases that help to test the yes/no validity of a hypothesis.
4. Maximum variation cases that illustrate a maximum or minimum dimension such as size.
5. Extreme deviant cases that are thought to be problematic or unusual.

Clearly a single case may have overlapping characteristics. For instance, The Coca-Cola Company Inc could be seen as both a paradigmatic exemplar of the fast-moving consumer goods sector and as a maximum case in terms of its global size (it could also turn up in a random sample). This dichotomy will be taken into account in the Chapter 4 selection of cases.

Triangulation is another methodological consideration. I here describe it as using three sources against which data interpretation can be validated. This is particularly important to this project because my starting position in Chapter 1 recognises the epistemic risks of creative accounting and fraudulent misrepresentation in management commentaries. Therefore most data used in the research cycles of Chapter 4 and Chapter 5 is sourced from audited financial statements. In this research I have triangulated this data in the following ways:

- internal consistency checks, such as checks between accounting and cash flow data
- time series checks for unusual fluctuations over several years
- cross checks against qualitative data as reported in management commentaries or in the detailed notes to the accounts
- in the few cases where I obtained data from public domain databases these were test checked on a sample basis back to the original audited financial statements to ensure (a) the databases were up to date and (b) the databases were an accurate representation of the underlying raw data.

Since “data can confound as well as confirm our expectations”, disconfirming data is part of the research story requiring analysis and reflection (McNiff and Whitehead 2010 page 102, also Dick 2002). Disconfirming data is therefore highlighted throughout the research cycle write-ups.

Although I have undertaken this project as the partner in charge taking my firm in a new direction, I have sought out opportunities to collaborate with those interested in a similar learning process around capital allocation (McNiff 2002) including professional colleagues, client personnel and online forums at [www.iii.co.uk](http://www.iii.co.uk), [www.motleyfool.co.uk](http://www.motleyfool.co.uk) and the London Business School alumni online forum. Due to the relative anonymity that these forums provide, participants seem willing to confess their errors, interact, pose questions, debate and provide comments on the posts of others. I also discovered during the TR Property Trust PLC case study these forums are used by at least some members of the London professional investment community. These various collaborations are interspersed throughout the research cycle write-ups.

### **Tools supporting the methodology**

Real-world case studies methodology is supported by a number of tools: micro-analysis, open-ended interviews, and software package Microsoft Excel 2010 within which further computational tools were developed.

Strauss and Corbin (1998) recommend what they call the microanalysis of qualitative data on a word-by-word basis that is used to develop theoretical structure across a variety of relevant literature sources with the aim of generating grounded theory. This could be regarded as a methodology in its own right. But I selected it here as a tool because producing a grounded theory is not the aim of this project.

Given the breadth of the subject of capital allocation I was not able to go to the minute depth recommended by Strauss and Corbin (1998). But their general approach to structured microanalysis proved to be a helpful way of bringing a consistent discipline to the analysis including the adaptation of capital allocation principles obtained from the Chapter 2 literature review into the Chapter 4 research tools. This was achieved through deconstructing the literature into its component conceptual categories as explained in the critical discussion at the end of Chapter 2. The coding structure, based mainly on DuPont (Brealey *et al* 2006, Soliman 2008) and carefully selected accounting ratios derived from the literature review critical reflections plus my own experiential reflections were typically dimensionalised into expected ranges



(such as 0%-100%), and were adapted as formulas in a customised accounting research database.

Microsoft Excel 2010 was used for the database as it allowed for data analysis across 255 worksheets, >1 million rows and >16,000 columns, that is > 4,080,000,000,000 (4.08 trillion) cells of data which is more than enough for this project and beyond. Qualitative data can also be captured as each cell can take 32,767 text characters. I know experientially that another benefit in using Excel is that unlike Microsoft Access or customisable databases such as SAP or Oracle, Excel is a more flexible tool to work with, especially as parameters such as the coding structure or number of case studies needed to change repeatedly during the research cycles.

From over two decades of experience in using Excel and its predecessors I am aware that a key limitation in using it is the risk of “garbage-in-garbage-out”. To address this risk my methodology recognises the importance of audit checks in order to minimise the risk of data errors.

Interviews were sought with management from the case studies and other market participants in order to confirm the validity of the case study analysis as well as to gain even deeper insights into capital allocation decision-making processes. The results of these interviews are built into the case study findings in Chapter 5.

### **CRITICAL REFLECTION: Methodology conclusion**

I recognise that methodology selection is fundamental to achieving this project’s aims in answering the research questions. But just as importantly, the methodology will form the basis of how my firm operates well into the future. Real-world case studies allow for a wide-ranging exploration of the topic in a real-world context, and simultaneously allow me to maximise the advantage of the trans-disciplinary nature of my own career experiences across accounting, auditing, corporate finance, mathematics and practical usage of information technology. Revisiting Revans’ lamentation of the triumph of “book” over “tool” (Revans 1991), this project aims to give primacy to the development of tools to enhance capital allocation reflexivity.

Neither the methodology nor the tools will provide a final proof as to how to mathematically optimise financial capital returns, but it is hoped they will at least provide transferable learning for decision-making which is capable of being continuously developed with data accumulation, experience and reflection. In this way this project is the starting point of a methodology reinforced through continuous real-world case study learning.

This represents an improvement over at least some of the methodologies underlying the Chapter 2 literature where broad assumptions about future returns were sometimes made and real-world phenomena were sometimes deliberately ignored.

## Chapter 4 – Analytical tool construction

### Analytical tool objectives

The objectives of this research cycle are to further develop the techniques envisaged by RESEARCH QUESTIONS 1, 3 and 4 and to survey the market for additional case studies as required by RESEARCH QUESTION 2 to carry into the next research cycle. Recalling Revans' concern (Revans 1991) that 'book' had triumphed over 'tool' in solving workplace challenges, in this chapter my plan is to give primacy to the development of tools arising from the book learning of the Chapter 2 literature review.

According to the respective stock exchange websites the universe of financial capital allocation opportunities includes around 3,000 securities listed on the London Stock Exchange, around 8,000 on the New York Euronext Stock Exchange, around 3,600 listed on NASDAQ, around 1,500 on the Shanghai Stock Exchange, around 2,000 on the Tokyo Stock Exchange, and around 2,300 on the Australian Stock Exchange. Even allowing for dual listings, this represents 20,000 capital allocation opportunities across the major capital markets plus thousands more in the Middle East, Singapore, Hong Kong and others.

Add to this an indeterminable number of off-market opportunities among unlisted businesses, direct investments in commercial and residential properties, new business start-ups and so forth and the number of capital allocation opportunities is probably a multiple of the number of securities listed on the world's stock exchanges. Each business or share or bond or property asset possesses its own unique opportunity and risk characteristics requiring careful analysis by the capital allocator before committing capital<sup>15</sup>.

The literature review has helped in delineating the kinds of issues that need to be taken into account in capital allocation decision-making including financial metrics used by the various practitioners and academics and the dangers of creative and fraudulent accounting. Efficient Market Hypothesis in its strong form has been

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<sup>15</sup> Unless of course you agree with Malkiel's assertion that a blind chimpanzee can allocate capital as well as the best analyst by throwing darts at the financial pages (Malkiel 2006). However this view has been rejected in the critical discussion of the Literature Review in Chapter 2.

discarded, which means the considered reflexive efforts of the capital allocator are, in my view, capable of outperforming the results of chimpanzees or index funds (Malkiel 2006). The literature review has also drawn attention to the characteristics of companies which have incrementally added to capital, such as Berkshire Hathaway, and companies which have subtracted capital, such as LTCM, Enron and Northern Rock.

Following on from that, how should the researcher manage the voluminous data constantly generated across the markets? The DuPont system (Soliman 2008) provides a framework which can be used within the real-world case study methodology. Buffett claims to do the analysis in his head without the use of a computer (Lowenstein 1998, Schroeder 2008) and this may explain his need for frequent head rubs (Schroeder 2008). Alternatively computerised databases are likely to be an effective way to store and analyse large volumes of financial data.

### Survey of potential databases

The market produces a variety of research databases. A selection of those databases existing at the time of this research and the results of my evaluation in descending order were as follows:

Database name	Logon	Description	Availability	Evaluation
Interactive Investor <a href="http://www.iii.co.uk">www.iii.co.uk</a>	Personal logon required	Accounting ratio analysis for UK listed companies. Market price information (15 minutes delayed). Historic prices and charts. Company-specific blogging is permitted. However underlying accounting data is not available. Caution needed as I found errors in accounting data (Abcam PLC).	Freely available to public	Good
EDGAR <a href="http://www.edgar.com">www.edgar.com</a>	N/A	All publicly reported financial data and related qualitative disclosures. Mostly in PDF format rather than readily usable data. US listed companies only.	Freely available to public	Good
Financial Analysis Made Easy (FAME)	Athens	Sophisticated albeit cumbersome searches on UK listed and unlisted companies. Can set multiple criteria. Can download into Excel multiple companies based on	Middlesex University	Good

		financial criteria. Data and classification errors noted (Appendix 5).		
Motley Fool <a href="http://www.fool.co.uk">www.fool.co.uk</a>	Personal logon required	Qualitative information rather than quantitative data. Includes informed articles and theme and company-specific blogging by users. No underlying accounting data. Good for obtaining others' opinions and for generating ideas.	Freely available to public	Good
Trustnet <a href="http://www.trustnet.co.uk">www.trustnet.co.uk</a>	N/A	Historic data on the performance of UK investment trusts. This only shows market price performance. There is no underlying accounting data.	Freely available to public	Moderate
Share Scope <a href="http://www.Sharescope.co.uk">www.Sharescope.co.uk</a>	N/A	Seems to allow data analysis on UK stock market and some US stocks. No access to underlying data.	Subscription £300 pa	Moderate
Really Essential Financial Statistics (REFS) <a href="http://www.companyrefs.com/">www.companyrefs.com/</a>	N/A	Ratio analysis rather than accounting data analysis. Multiple financial ratio filters but no access to underlying data.	Subscription various levels approx £500 pa	Moderate
Business Insights <a href="http://www.globalbusinessinsights.com/subscription.asp">http://www.globalbusinessinsights.com/subscription.asp</a>	Athens	Qualitative reports into specific industry sectors. No data. Only qualitative reports.	Middlesex University	Moderate
Hemscott <a href="http://www.hemscott.com">www.hemscott.com</a>	N/A	Moderately useful company information but not detailed accounting data. Can find out broker recommendations.	Freely available to public	Moderate
Dun and Bradstreet	N/A	Data as submitted to regulators, typically registration details, director and shareholder details, and limited financial data. Also includes other publicly sourced data such as court judgements and some media articles. Plus D&B's own inhouse data such as risk scores. For smaller companies the data is not necessarily up to date.	Various subscription levels	Moderate
Emerald <a href="http://www.emeraldinsight.com">www.emeraldinsight.com</a>	Athens	Searchable academic articles. A second best to Business Source Complete.	Middlesex University	Moderate
Companies House <a href="http://www.companieshouse.gov.uk">www.companieshouse.gov.uk</a>	N/A	Registration details of all UK listed companies but no qualitative or	Freely available to	Poor

<a href="http://gov.uk">gov.uk</a>		quantitative data.	public	
BUBL <a href="http://www.bubl.ac.uk/index.html">www.bubl.ac.uk/index.html</a> BUBL Information Service, Centre for Digital Library Research, Strathclyde University, Glasgow G1 1XH, Scotland	None	Allows article searches by author and/or subject across reputable journals. But when I tried finding any of my own articles it only took me to the IIA website. Also two tested links did not work (“Applied financial economics” and “Top 50 financial websites”). Moderately useful for serendipitous browsing.	Freely available to public	Poor
Datastream	N/A	Available by subscription only for academic institutions and institutional investors. Not available to London Business School alumni. At Middlesex University, Datastream can only be accessed via four terminals in the Shepherd Library.	Four terminals on Middlesex University London campus	Poor
Intute	Shibboleth	Social data rather than business data.	Middlesex University	Poor
Australian Securities and Investments Commission (ASIC) <a href="http://www.asic.gov.au">www.asic.gov.au</a>	N/A	Virtually no data available except the name or registration number of a registered company. Australian companies only. Additional information is only available through ASIC’s information brokers (eg Dun and Bradstreet).	Freely available to public	Poor
Biz Ed <a href="http://www.bized.co.uk">www.bized.co.uk</a>	None	Some economic data and link to Office of National Statistics. Company data is limited to 37 companies. On testing Glaxosmithkline I found the most recent data was 2002!	Freely available to public	Poor
BNET <a href="http://findarticles.com/">http://findarticles.com/</a>	N/A	Journal articles. But search facility is effectively useless as it does not allow even basic precision when specifying search criteria.	Freely available to public	Poor
CAROL <a href="http://www.carol.co.uk">www.carol.co.uk</a>	Personal logon required	No incrementally available information.	Freely available to public	Poor

Figure 6 – Selection of available databases

### Dataset utility, limitations and generalizability

The comparative analysis of databases was revealing and disappointing. Despite that companies are required to produce financial statements in accordance with

accounting standards, and have those financial statements audited and submitted to government regulators, such as UK Companies House, the US Securities Exchange Commission and the Australian Securities and Investments Commission, only the US regulator makes that information available to the public. For the UK and Australia, the regulator sells information back to the public via private sector information brokers such as Dun and Bradstreet. And even then the data is available only with constraints on how the information broker allows it to be used.

The most useful databases for the purpose of this research were Interactive Investor which was also recommended by TR Property Trust manager Chris Turner when I met with him in London on 5 Aug 2010 this research, FAME and Trustnet. Each could be used for ratio analysis and filtering out companies which met user-specified multiple criteria. Interactive Investor had the best user interface in terms of ease of use as well as a number of other research tools like historic market price data and company-specific blogs. In contrast the user interface on FAME made it particularly difficult to use thereby increasing the risk of user error (see also Appendix 5).

However in each case the underlying accounting data was not accessible, which limited the usefulness of the databases for the purposes of microanalytical research. The limitations included:

1. A small number of criteria and limited ability to simultaneously combine criteria for multi-variable filtering.
2. The restriction of available ratios to those which had been pre-specified by the database owner. None of the databases allowed me to select companies using all the criteria arising from the literature review, particularly in relation to multi-year analysis.
3. Related to that, it was not clear how given accounting ratios had been derived. For instance, the price-to-earnings ratio could use the latest reported earnings, adjusted earnings, future estimated earnings and so forth. All the databases showed was the result of the calculation without explaining which derivation had been used.
4. The inability to drill down into deeper levels of the underlying accounting data.

5. The inability to do ratio analysis on combined years of data.
6. None of the databases held segmental data, instead showing only consolidated revenue and cost data for all business segments combined. Segmental data is important when analysing businesses which operate across multiple segments, such as Tesco PLC which operates as both a supermarket chain and a financial services business; or across multiple geographies, such as The Coca-Cola Company Inc.

In aggregate, these represented severe epistemic limitations which effectively rendered the databases unusable for the purpose of fully exploring the research questions.

Therefore the publicly available databases were of use only in a limited way for identifying companies for case study purposes, but even this only provided me with a list of companies for further analysis. To carry out that further analysis I needed to visit the individual company websites to locate their historic audited financial statements and other financial data as this was not available in any of the databases at the depth needed for the microanalysis. To overcome the limitations of the publicly available databases I supplemented the case study candidates list with additional case studies which had emerged from the literature review as well as examples from my own experience where I had the benefit of inside knowledge.

A new epistemic risk also emerged when reviewing the public databases: they were not wholly reliable. The Biz Ed database was years out of date and therefore not useful for this research. But even the flexible and seemingly up to date Interactive Investor database contained erroneous data on the number of shares in issue in respect of Abcam PLC. Although it showed the correct number of shares in issue following their Nov 2010 five for one share split, the underlying ratio calculations were found to use the pre Nov 2010 number of shares<sup>16</sup>.

These problems are consistent with my experience as a practitioner where I have found client databases to contain a variety of errors including input errors, spelling

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<sup>16</sup> On finding this fundamental error I drew it to the attention of other website users on the relevant Abcam PLC blog page.



errors, out of date data, field classification inconsistencies, duplicate or missing records and so forth. The errors can be compounded if different personnel are involved in updating the database.

Because of the existence of errors and the unavailability of underlying accounting data in any of the databases, I decided to create my own accounting database for the purpose of this research. I also had to find other ways to select the case studies rather than relying exclusively on the commercially available databases.

### **Construction of a customised accounting research database (CARD)**

Due to the abovementioned limitations in the publicly available databases, I planned a customised accounting research database (CARD) for the purpose of this project to have the dual benefit of providing analytical flexibility as well as creating a valuable and growing repository of intellectual property. The CARD would also need to address:

- all of the error types I had encountered experientially including those found during this research (Appendix 5, for instance)
- the financial metrics arising from the Chapter 2 literature review
- and Malkiel's challenges also from Chapter 2.

In building the CARD the primary objective was to create a receptacle of multi-year accounting data needed for the case study microanalysis which is also capable of growing year-by-year ad infinitum. That is, there must be no constraint requiring the addition of new years of data to over-write historic data as occurred at the ratings agency. In this way the CARD will hold an ever increasing quantity of historic data.

The CARD should grow in informational value as new data is added over the coming years. Flexibility both in terms of being able to add future data and in being able to modify the analysis from time to time is a requirement. By adding new data each year, the database will become a rich source of multi-year trend data that is unavailable elsewhere.

A secondary objective was to create a database which holds not only historic data but which also includes the facility to input future forecast data based on any combination of quarterly results or analyst/broker estimation.

A tertiary objective was to address and minimise the epistemic risks which had been identified in the publicly available databases.

### **Stage 1 CARD architecture and data integrity**

The literature review identified the key accounting data fields and composite ratios needed to support financial capital allocation decisions. Together these were used to design the database template structure. The structure of the database went through several revisions during the case study research as refinements were made to the efficiency and integrity of data input and the informational value of the ratio formulas.

The CARD was then populated with the financial data of over 40 companies for on average five years each i.e. over 200 years of financial data being balance sheets, income statements, cash flow statements and supplementary data such as price data, segmental data, and director remuneration.

My starting point in designing the CARD structure was the DuPont financial analysis system from the Chapter 2 literature review (Brealey et al 2006, Soliman 2008). I augmented that with additional metrics aimed at analysing capital structure (Modigliani and Miller 1958), Graham's ratios (Graham 1976) other metrics arising from the literature review and several audit metrics arising from my own experience aimed at highlighting accounting fraud or error as explained in Figure 5. Several metrics from the literature review were rejected as disinformational as explained in my literature review critique. These included Slater's Price Earnings Growth factor (Slater 1998) and Sharpe's beta (Sharpe 1964).

To aid the reader I attempted to summarise the metrics used in the CARD structure along similar lines as shown in the DuPont system. But due to the large number of ratios and their complex inter-relationships the resulting diagram proved inelegant. Figure 7 shows a simplified map of the metrics and builds on the Figure 5 matrix shown in answer to RESEARCH QUESTION 4 in the Chapter 2 literature review. What

we have here is a synthesis of metrics arising from DuPont (Soliman 2008), Modigliani and Miller (1958), Graham (1976), Slater (1998), Stern, Stewart and Chew (2001) and metrics oriented towards business risks as highlighted by Shirreff (2004), Harris (2005) and Stiglitz (2010). None of these metrics are original to me but are described in the literature, except insofar as I modified them to address Comprehensive Earnings rather than Reported Earnings as pointed out in my answer to RESEARCH QUESTION 1 in the Chapter 2 literature review. In addition to those metrics, the *shaded* metrics in Figure 7 are the distinctive metrics I have developed experientially to spot accounting error or earnings management through looking for patterns in subjective estimations and dis correlations between accounting, tax and cash flow data. To further distinguish them from the metrics I have borrowed from the literature review, they are also shaded in Appendix 4.

Taken together, all of the metrics identified in Figure 7 – which combine those identified in the literature and those I have developed – are carried into the CARD as illustrated in Appendix 4, categorised in accordance with the groupings identified in Figure 5 (“asset strength”, “business returns”, “shareholder returns”, “risks” and so forth).

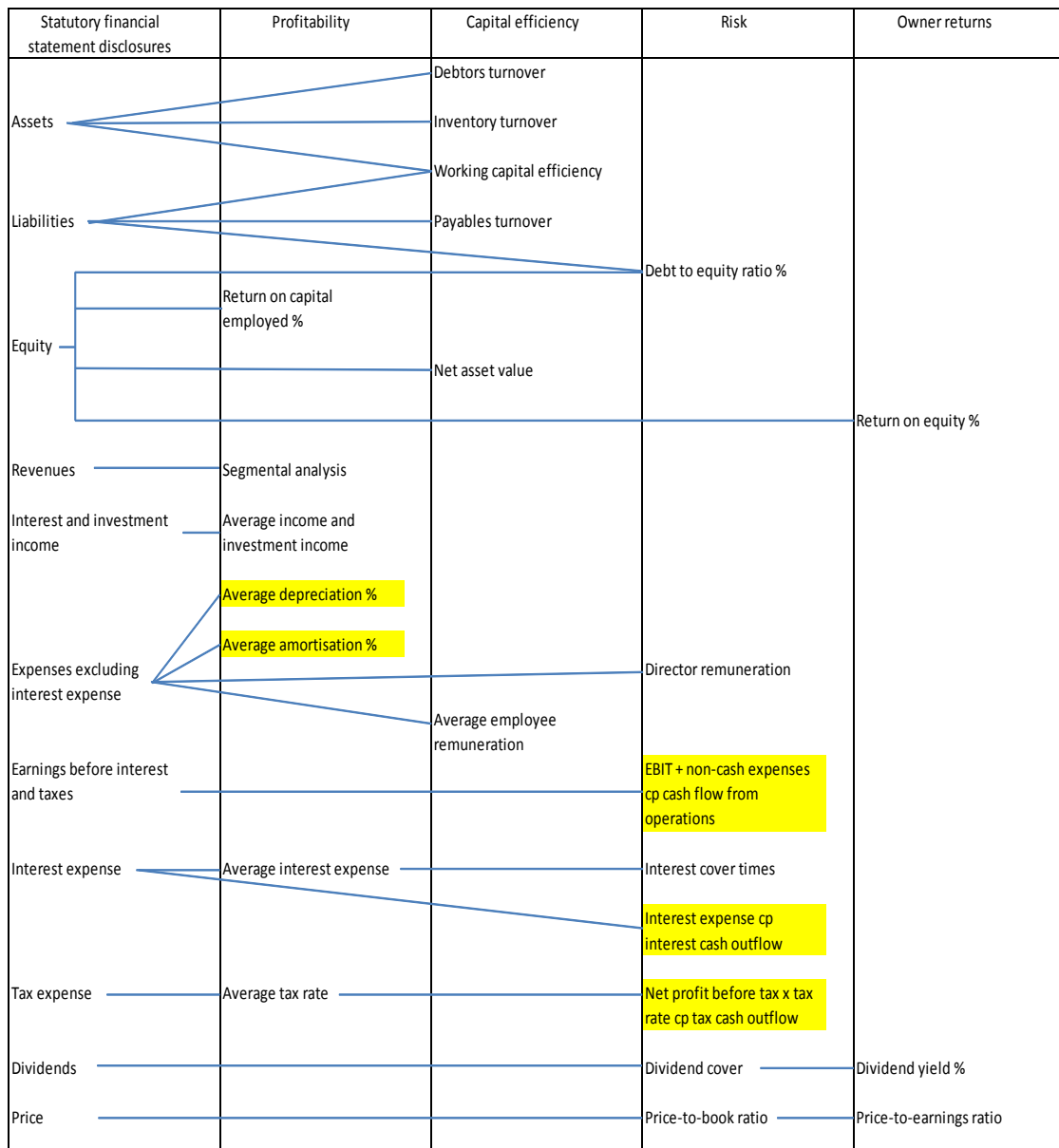


Figure 7 – Simplified map of ratios used in the CARD with triangulation metrics highlighted

## Stage 2 steps taken to minimise CARD epistemic risks

Using my two decades of on-the-job experimentation with spreadsheet integrity in consultation with past colleagues, input integrity has been assured albeit not guaranteed through the following measures:

- Most of the data was input directly from audited financial statements through cut-and-paste to minimise the risk of transcription errors.
- As the data was input it was reviewed for reasonableness and where necessary checked back to the management commentary or notes to the financial statements.

- c) Even where individual data elements have had to be combined in order to fit with the database field structure, the amounts have been entered individually so that they can be traced back to the original audited financial statements to provide an audit trail from the CARD back to the audited financial statements.
- d) Multiple inbuilt formula checks were included to ensure subtotals in the income statement, balance sheet and cash flow statement were arithmetically correct.
- e) Warnings were included which trigger visible error messages for example if the balance sheet does not balance or the cash flow statement does not sum to zero.
- f) Triangulation between individual data elements which should be equal or approximately the same, such as accounting data, cash flow data and time series.
- g) The use of narrative comments was included for noting unusual year-to-year movements and to assist with classification consistency.

In this way the CARD is the product of reflection on a twenty year career as well as the outputs from the literature review.

### **Stage 3 Data integrity metrics built into the CARD**

Reflecting on my own experiences what I did not see in the literature was any reference to audit metrics recognising the vulnerability of accounting data, other than a yes/no reference to AQ (audit qualification) by Abarbanell and Bushee (1997). As a finance professional and auditor for over two decades I have observed and developed a number of techniques for identifying errors and frauds in published financial statements and have previously used these to avoid allocating capital to suspect companies. Tell-tale signs of accounting misstatement or fraud include discrepancies between accounting and cash flow data, ratios with unexpected divergent trends, ratios suggesting inappropriate capitalisation of expenses onto the balance sheet, unusual accounting policies particularly those which are subject to management estimation and so forth. I would therefore add the following ratios, which I believe are original as they did not appear throughout the literature review:

- Time-series correlation of accounting tax expense compared to cash tax outflow. Although the two will not be the same due to permanent and timing differences, they should ebb and flow over time. Persistent differences over time could suggest the profits reported for accounting purposes differ significantly from the profits reported to taxation authorities.
- Time series correlation of cash flow from operations compared to EBIT (earnings before interest and taxes) plus non-cash expenses added back. Again these should approximately correlate over time, so marked differences may suggest reported accounting profits are not reflected in actual cash movements.
- Time series comparison of interest received and paid between the income statement and cash flow statement. Divergences could suggest persistent capitalisation of interest expense onto the balance sheet as a way of augmenting reported profits.
- Yearly consistency or otherwise of average depreciation/amortisation rate as this is subject to management estimation and could therefore be manipulated to artificially manage earnings over time (Griffiths 1992).

#### **Stage 4 Data integrity and reflexive originality in the CARD**

In light of the literature review and critique I modified the price-to-earnings ratio to reflect the volatile earnings components that appear in the IFRS Statement of Comprehensive Income, and its predecessors under UKGAAP and USGAAP. Those earnings components include unrealised foreign exchange movements, pension liability actuarial revaluations and other fair value adjustments. These can be significant yet by excluding them from the Income Statement they are automatically excluded from the calculation of reported earnings in all of the publicly available databases. Yet in the literature Athanasakou *et al* (2009) and Athanasakou *et al* (2011) had drawn attention to the vulnerability of earnings to this risk of classification shifting.

Therefore in a departure from the publicly available databases, the CARD uses Comprehensive Income with income tax added back as a substitute for Pre-Tax Earnings as a way of negating the risk of classification shifting, and this flows through

to all earnings-related metrics in the CARD. In this way the CARD helps in analysing balance sheet movement over time rather than merely the reported earnings in a given period.

After several iterations and refinements the final version of the CARD had two sections: firstly the raw accounting data as manually input from each company's audited financial statements; and secondly a ratio analysis worksheet showing the key financial and audit metric calculations. Sample screenshots from each of these two sections are shown as Appendix 3 and Appendix 4 respectively.

Inbuilt audit checks colour coded green minimise the risk of input data error. Once entered, the company's data is permanently stored for future trend analysis.

A key advantage of this database is its ability to capture segmental revenue and costs, something which was not available in any of the publicly available databases. Under UKGAAP and IFRS 8 the presentation of segmental data is at management's discretion resulting in presentational variation from company to company and even from year to year within the same company, which may explain why databases cannot easily capture segmental data. For some companies, the segments are product based while others report on a geographic basis or both. By capturing segmental data, this significantly increases the analytical power of the CARD.

The ratio analysis, part of which is illustrated in Appendix 4, feeds off the raw data and in line with spreadsheet best practices requires no data input (unlike the rating agency database). While the database can hold virtually unlimited raw data, the ratio analysis is designed to analyse up to 20 years for which the user can select any combination of companies and years held in the database in order to allow trend analysis and side-by-side comparisons of different companies. This flexibility to select a variety of side-by-side comparisons makes the CARD more flexible and reflexive than any of the publicly available databases. Side-by-side flexibility is mostly achieved through Excel's HLOOKUP function the syntax of which is as follows:

```
=HLOOKUP(Lookup_value, Table_array, Row_index_num, Range_lookup)
```

This standard Excel formula syntax did not provide the plasticity I needed for the analysis as Table\_array only allows a single table to be looked up whereas I needed to look up simultaneously the company table and the year table. After a few experiments and discussion with peers a breakthrough came when I combined HLOOKUP with INDIRECT and Excel's ability to concatenate separate data fields as follows:

```
=HLOOKUP(Lookup_value, INDIRECT(Ref_text), Row_index_num, Range_lookup)
```

This composite function with Ref\_text directed to a concatenate formula combining both the company name and the year under analysis allowed me to specify any company as well as any year in the database. In this way I was able to analyse a company chronologically from year to year to study trends, or to compare it against other companies in the same year, or any combination of both. The flexibility to build these types of composite functions in Microsoft Excel added to the CARD's analytical utility.

The effort to produce the CARD was therefore worthwhile as it has allowed greater depth of analytical insights for the Chapter 5 case studies.

### **Limitations of the CARD**

Through multiple stages of development, the inclusion of data integrity measures, the development of metrics designed to expose creative accounting and a design which encourages reflexivity in its use, the CARD is still not without its limitations. Like any one-size-fits-all database, it captures financial data within a standard input template structure from a variety of sectors so compromises have had to be made in summarising the different financial characteristics of each firm. Therefore field classification inconsistencies remain a possibility.

Furthermore even though the CARD endeavours to faithfully capture historic audited financial data, that data has been subject to historic changes firstly to general accounting practices, such as the switch from UKGAAP to IFRS; and also changes in each company's own accounting policies from year to year. This can affect interpretation when analysing companies over periods when accounting policies may



have changed. This was seen for instance in the commercial property Chapter 5 case studies where the introduction of IFRS in 2005 brought about the inclusion of property value changes into the income statement rather than exclusively onto the balance sheet under UKGAAP. Cross-checking the income statement with the cash flow statement is one way of seeing through those kinds of accounting policy changes.

Nonetheless the CARD should serve the needs of this research significantly better than the commercially available databases in terms of better data reliability and analytical flexibility.

### **Risk analysis tool**

The aim of the CARD is to monitor capital allocation opportunities over time with a view to aiding asset selection. For assets which are short-listed for selection, I developed a supplementary risk analysis tool using Monte Carlo to help in studying potential future risks. Monte Carlo had featured in the literature review as a technique potentially available to the capital allocator in helping to understand the risk of a particular decision. During discussions about Monte Carlo with colleagues particularly Dr David Alexander of the Australian CSIRO with whom I subsequently published an article on Monte Carlo in *Accountancy*, an Australian railway asked my firm to assist with experimental usage of Monte Carlo as a way of maturing their existing qualitative risk management approach. This provided an opportunity to put theory to practical use and to have the results independently debated at the client's quarterly Audit and Risk Committee meetings throughout 2011 and 2012.

By seizing an opportunity to develop my understanding and usage of Monte Carlo, this assisted the achievement of another tool to support RESEARCH QUESTION 4.

Estimating the likelihood and impact of future risks is subjective as the future is unknown. Widely-used risk matrices, as recommended by ISO31000 published by the International Organisation for Standardization, Geneva and as used at the railway client, convert discrete risks into alphanumeric scores in a 5x5, 6x6 or similar matrix as shown in Figure 8. Experientially I knew that risk matrices can suffer from adumbration as well as incorrectly calibrated upper and lower limits which can distort the understanding of risk priorities, as shown in the axis labels in Figure 8.

		LIKELIHOOD AXIS				
5x5 Risk Matrix		C5	C4	C3	C2	C1
		$\$0 \leq \text{cost} \leq \$10\text{m}$	$\$10\text{m} \leq \text{cost} \leq \$20\text{m}$	$\$20\text{m} \leq \text{cost} \leq \$40\text{m}$	$\$40\text{m} \leq \text{cost} \leq \$80\text{m}$	Cost > \$80m
IMPACT AXIS	F1 - Could occur daily to monthly	2				
	F2 - Could occur monthly to yearly	20	2	1		
	F3 - Could occur once every 10 years to once every year	35			1	1
	F4 - Could occur once every 100 years to once every 10 years	13				
	F5 - Could occur less than once every 100 years	12	1		1	

Figure 8 – Risk matrix for a private sector railway company

Alternatively if organisation risks are analysed as a probability distribution using Monte Carlo without trying to categorise risks into a predefined matrix the analytical outputs can link directly to insurance coverage, hedging, audit programmes and management action. This can then promote a dialogue with management at shareholder meetings.

The literature on Monte Carlo (Bernstein 1998, Tamosiuniene and Petravicius 2006, Groenendaal and Francisco 2006, Suhobokov 2007) assumed specialised statistical software would be used and therefore did not explain the underlying mathematical technique. At the railway client I used Monte Carlo within Microsoft Excel to construct a risk probability distribution from thousands of random scenarios based on management's risk estimations valued in today's currency.

### Development of Monte Carlo risk analysis tool

The starting point was to capture an understanding of each risk through case study analysis of reported disclosures, benchmarking against similar organisations and consultation with knowledgeable management. Each risk can then be understood in terms of its likelihood and impact from which a scatter graph can be generated. An example as developed over a five year forward looking horizon for the railway client is

shown as Figure 9. In this case I had identified around 90 risks each with its unique likelihood, consequence and reputation characteristics.

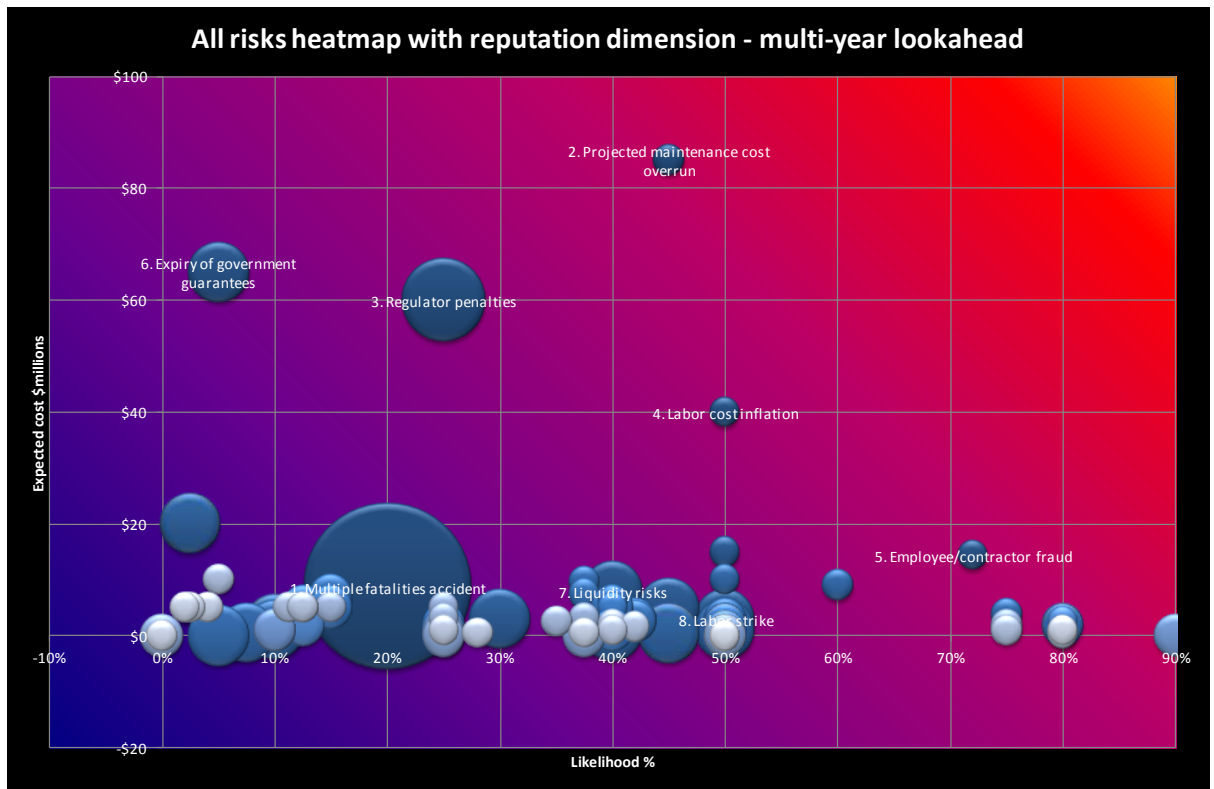


Figure 9 – Risk scatter graph for a private sector railway company

As with the risk matrix in Figure 8 which was based on the same underlying data, the scatter graph plots each risk against its likelihood and impact. But unlike a risk matrix, the scatter graph does not constrain risks to predefined upper and lower limits nor does it contain hidden geometric scaling. Instead each risk is plotted against its probability (x axis) and upper cost estimate (y axis) and reputational impact (z-axis which gives the size of the bubble).

By using Monte Carlo this data on individual risks can be aggregated into a probability distribution using pseudo-random numbers. The characteristics of each individual risk are analysed in terms of their particular probability distribution, which could be a ‘normal’ bell curve, or a block distribution or a binary yes/no distribution, for instance a legal action which could be won or lost and so forth.

As individual risk distributions are added, the likelihood of a zero outcome, the left tail of the distribution, across all risks diminishes. This is because for each new risk added,

the probability that neither risk occurs reduces. For instance a single risk may have a 50/50 chance of occurrence. By adding a second risk with similar 50/50 likelihood, the probability of a zero outcome in which neither risk occurs reduces to  $50\% \times 50\% = 25\%$ . If a third 50/50 risk is added the zero risk likelihood reduces further to  $50\% \times 50\% \times 50\% = 12.5\%$ . The more risks added, the less likely it is that none of them will occur.

Simultaneously as more risks are added the right tail grows towards its upper limit. The limit is that all the risks occur at their worst estimated outcome. So while the left tail of the distribution shrinks, the right tail grows. The middle portion of the distribution adopts a shape that fits with the aggregate of probabilities and cost estimates provided by management. It may not be a 'normal' curve and it may not be smooth. The shape depends on how the individual risk distributions cluster when aggregated. Hence the distribution of all risks is usually skewed to the right rather than 'normal' bell curve as pointed out by Mandelbrot (1966) and Taleb (2007).

This produces a right-skewed probability distribution built up from knowledgeable management's best estimates for each individual risk and showing the most likely range across all of the risks in aggregate. This is more meaningful than simply calculating the average value (expected cost x probability) or slotting individual risks into a pre-defined risk matrix as in Figure 8 because it shows the distribution from best to worst case scenarios and the most likely spread in between.

Although the scenarios were random, they were constrained by the probabilities and cost impacts gained in the research and management consultation phase. So they were pseudo-random rather than unconstrained-random. I used pseudo-random number generation in two ways: firstly a random trigger as to whether or not a risk occurs based on the probability estimate; and secondly a random cost impact between the upper and lower cost estimates from the research phase. Using the RAND() function to generate a random number between 0 and 1 resulted in the following formula syntax for those risks which followed a simple block distribution:

```
=IF(RAND()<=C3,C1+(C2-C1)*RAND(),0)
```

Where,

C1 is the lower cost limit if the risk occurs

C2 is the upper cost limit if the risk occurs

C3 is the probability between 0 and 1 of the risk occurring

The first RAND() is the trigger as to whether or not the risk occurs. If the risk does not occur (i.e.  $RAND() > C3$ ) then the formula returns a zero value. If the risk does occur (i.e.  $RAND() \leq C3$ ) then the second RAND() generates a random value between the upper and lower cost limits. Applying this formula across all risks creates one scenario, or in other words one version of what the future might hold. For Monte Carlo to create a probability distribution thousands of scenarios are needed.

### **Risk tool results and dialogue with management**

For the rail client I created 10,000 random scenarios describing expected costs split both pre-mitigation and post-mitigation. These scenarios then provided a probability distribution showing the worst case (i.e. that most of the risks occurred at their worst cost estimates), what was likely to occur, and the best case scenarios as shown in Figure 10. The shape of the railway client's distribution was uniquely based on the probability and cost estimates of all business risks in aggregate.

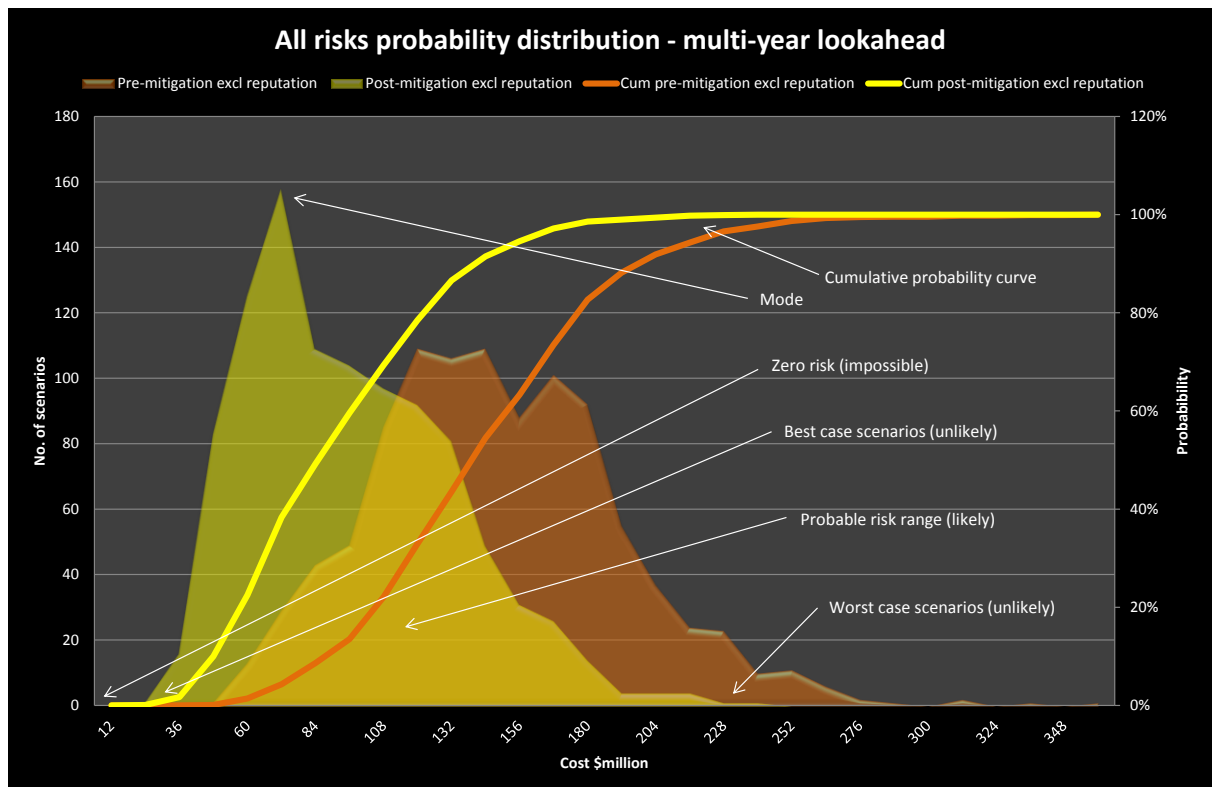


Figure 10 – Risk probability distribution using Monte Carlo

The S-curve showed the cumulative probability enabling the capital allocator to ascertain the likely maximum cost at a given probability level, as well as the average value at risk at the 50% S-curve x-axis intersection.

With these insights I could engage constructively with management around which risks drive the cost estimates, the realism of the estimations, the completeness of risks and what management actions, insurance limits, hedging strategies or other management actions need priority in order to reduce risk across the organisation.

### OPTIMATE experimental optimisation tool

In working with Monte Carlo I also considered whether I could use it as an optimisation tool. Recalling from the Chapter 2 literature review that Hadar and Seo (1988), Black and Litterman (1992) and Clark and Jokung (1999) had each used calculus to optimise the returns on various types of portfolios, it seemed Monte Carlo could also be used as a method for optimisation by using it to experiment iteratively with assorted portfolio weightings. The problem in using calculus is that the functional description of future asset returns, which are still only estimations, may not be correct. In the literature, this was invariably either stated as given, or relegated to

“probability beliefs” (Markowitz 1952). Although Monte Carlo would only provide a probability distribution of possible future outcomes based on pseudo-random number generation, at least that would be consistent with the fact that the future is uncertain.

The objective of this research sub-cycle was therefore to experiment with optimisation using Monte Carlo. The data supporting future estimations would come from the CARD.

By this stage in the research process the CARD had already shown that assets have multiple return characteristics, most commonly a capital element and an income element; each with different risk characteristics and potentially different tax treatments. Another factor that had to be taken into account was the potential for future foreign currency movements where individual assets were designated in a currency other than Sterling. Through experimentation within Microsoft Excel I found that the way to optimise future estimated portfolio returns was to create a fictitious portfolio of multiple assets each with a range of expected return and risk characteristics. Due to the differences in how income and capital returns are taxed, the model had to take account of tax for each return type.

As OPTIMATE was intended to convert today’s best estimates into a probability distribution of future likely returns, thousands of future possible scenarios needed to be taken into account. As with future risk estimation, this is where Monte Carlo is suited to this kind of forecasting.

Once a fictitious portfolio was set up I needed to make frequent changes to asset weightings in order to ascertain the effect upon future return distributions. For this purpose I found it most useful to create a base case designated as Portfolio 1, and to create additional portfolios to keep track of changes to asset weightings. As a portfolio was superseded, it could be over-written. In this way I was able to compare the base case to different portfolio options whose net return characteristics improved with each iteration as inferior portfolios were overwritten by portfolios with higher net returns and/or lower deviations.

After the tool design, the main challenge was determining the multi-faceted future return estimations. As a database of historic return information, the CARD was a useful interface for this purpose. Using the CARD's historic returns data, combined with qualitative future return estimations based on the case study microanalysis, I was able to populate the OPTIMATE tool with data from which to run the Monte Carlo simulations on each portfolio.

### **OPTIMATE usefulness and limitations**

OPTIMATE helps in visualising portfolio construction and diversification in a way that can be more easily explained to others than might be the case with calculus. In doing so it is able to incorporate the inelegant computations arising from different return characteristics, different tax treatments, and the impact of foreign currency movements, which is in keeping with this project's aim to develop tools embedded in the real-world of business rather than the often simplified world of the literature.

As was found repeatedly in the Chapter 2 literature review, subjective inputs mean the outputs are also subjective. OPTIMATE does not determine future returns, but merely estimates what their distribution might be based on today's best estimations arising from the research methodology. The nature of probability distribution is that a range of possible outcomes is provided rather than a single answer. The use of OPTIMATE is therefore aimed at finding a probability distribution with a favourable mean and with deviation around the mean reduced to as low as practicable.

An unexpected finding from the OPTIMATE simulations was the disproportionate impact of foreign currency movements. Large currency movements, such as have been seen during the Global Financial Crisis, can convert favourable asset returns into unfavourable when measured in the base currency; and vice versa.

Returning to the literature, Taleb (2007) would probably criticise the utility of OPTIMATE on the grounds that it does not take account of "black swans". While that may be true, I have confronted this in the Chapter 2 literature review and suggested that what Taleb calls "black swans" are in fact normal market behaviour (also Roubini and Mihm 2011). In any case, OPTIMATE is sufficiently flexible to allow for future



return characteristics that can incorporate the possibility of what Taleb, or Popper (1959), would call a “black swan” event.

### **Selection of real-world case studies**

Having developed the first version of analytical tools for RESEARCH QUESTION 4 as informed by my experience and the Chapter 2 literature review, I turned to the selection of real-world case studies for RESEARCH QUESTION 2.

Recalling the case study dichotomy of Flyvbjerg (2011) from Chapter 3, I sought a sample of case studies that would help in testing the CARD’s utility as well as in answering the research questions across a variety of market sectors and geographies. Ideally a random sample of case studies across the population of listed and unlisted capital allocation opportunities would allow statistically valid conclusions. But due to the diversity and ever-changing nature of the underlying population – in terms of size, geography, market sector and so forth – a random sample would need to be excessively large and would only apply to a moment in time. A more discriminatory selection basis was therefore sought. Under Flyvbjerg’s dichotomy which allows a case to occupy multiple categories, I judged that a preponderance of paradigmatic cases supplemented by a selection of cases from the other categories (maximum, critical and extreme deviant) would help in testing the CARD’s utility and in answering the research questions, although would not allow generalised conclusions about the population of capital allocation opportunities.

How would these cases be identified? Due to the limitations in the publicly available databases which prevented me selecting case studies purely from the available data, case studies were selected using a number of quantitative and qualitative inquiries:

- a) Paradigmatic cases which had demonstrated decades of stable and improving profitability and returns on capital (Graham 1976). These were identified both through the Interactive Investor database (with regard to the most recent results only), the Trustnet database and through qualitative findings during the literature review.
- b) Maximum variation cases, where a company was particularly large or particularly small, or had maximum market sector or geographic coverage.

These came from the literature review as well as through engagement with bloggers on the Interactive Investor website and through my involvement in the London Business School Alumni Investors Club.

- c) Critical cases were included where they were thought to be particularly instructive in terms of their role in the economy particularly in light of the recent Global Financial Crisis.
- d) Extreme deviant cases which had either gone bankrupt unexpectedly or where I had inside knowledge.

The aim was to cover a broad range of case-study types to test the CARD's utility, and to develop an initial capital allocation approach as aimed for in the research questions. This resulted in the following candidates for case study analysis (in alphabetical order):

## Case study selection table

Business	Source	Paradigmatic	Maximum variation	Critical	Extreme/ deviant
Abcam PLC	Interactive Investor ratio analysis.		√ - new start-up		
Aero Inventory PLC	Investors Chronicle recommended company.				√ - bankruptcy
Amlin PLC	Interactive Investor ratio analysis.	√ - established industry player			
Aviva PLC	Interactive Investor ratio analysis.	√ - established industry player			
Berkshire Hathaway	Literature review (Lowenstein 1998, Schroeder 2008).	√ - established industry player	√ - diversity of market sectors mainly US		
British Land PLC	Interactive Investor ratio analysis.	√ - established industry player			
Coca-Cola Company Inc	Literature review (Buffett 1977-2012).	√ - established industry player	√ - global diversity		
Land Securities PLC	Interactive Investor ratio analysis.	√ - established industry player			
Livingwood	Personal experience as the business's part-time chief executive over a ten year period.		√ - new start-up √ - Australian market		√ - researcher intimate inside knowledge
Lloyds Bank PLC	Literature review.	√ - established industry player		√ - role in Global Financial Crisis	
Royal Bank of	Literature review.	√ - established industry		√ - role in Global	

Business	Source	Paradigmatic	Maximum variation	Critical	Extreme/ deviant
Scotland PLC		player		Financial Crisis	
Sage PLC	Interactive Investor ratio analysis.	√ - established industry player			
TR Property Trust PLC	Trustnet data filtering.	√ - established industry player			
Woolworths Group PLC	Interactive Investor ratio analysis had indicated this was a good buy back in 2007 and 2008.				√ - bankruptcy
COUNT		10	4	2	3

## CRITICAL REFLECTION: Research tools

4. From the above research into relevant literature and case studies, describe how the findings can be used to develop a new model which can be used to improve capital allocation decision-making and translate this into a knowledge based tool or suite of tools for use by my firm in providing value-adding client services .

The Chapter 2 literature review provided a basic outline of the kinds of parameters used throughout the literature to evaluate capital allocation opportunities. Due to data integrity issues and the non-availability of underlying accounting raw data, I was unable to rely on the publicly available databases. I therefore had to build my own database, the CARD, which went through several iterations as audit metrics and other innovations aimed at improving reflexivity were added.

Although the CARD has been designed to have greater integrity and flexibility than the publicly available databases, it is still only a database and therefore suffers from its template design and the risk – however small – of data input error or design error. To counter this, triangulation has been built into the CARD through the audit metrics.

The secondary and tertiary tools developed to meet RESEARCH QUESTION 4 made use of Monte Carlo firstly for risk analysis and secondly for iterative optimisation estimations. This was two quite different ways to use Monte Carlo. It could be argued that the inputs to the Monte Carlo tools are inherently subjective and therefore prone to error. To which I would respond that the models of Markowitz (1952), Sharpe (1964) and Black and Litterman (1992) all shared this characteristic. We do not have data about the future, so no matter what forecasting method is used we can only use best estimates as to what the future might bring. The advantage of the Monte Carlo risk analysis and portfolio optimisation tools is that I am not masquerading the outputs as predictive, but rather as a probable range of outcomes. This does underline the importance of capturing accurate data from which to make quality estimates about the future; and to revisit the future estimations as new information comes to light. In this way the Monte Carlo tools are not deterministic – in that they do not determine what future decisions should be – but are tools with which to aid reflexivity when making capital allocation decisions.

It could also be argued that Monte Carlo is not new. In fact nor are Microsoft Excel, financial algebra and accounting ratios. What I have sought to achieve here is a distinctive synthesis of academic and practitioner knowledge, my own experiences and tools which can support capital allocation analysis and decision-making.

The other aim of this research cycle was the determination of case study candidates.

2. Through critical data analysis determine which businesses in the corporate sector have been consistently good at capital allocation throughout both good times and periods of crisis and seek disconfirming data from businesses which have been poor at capital allocation with the aim of producing a list of case study candidates for further analysis.

While the case study candidates cover a range of sectors and geographies, they are not a representative statistical sample of the economy nor any particular sector and therefore the findings will not be generalisable across any markets. The purpose of the case studies is to test and further develop the primary CARD tool.

I now test and refine these tools in the Chapter 5 case studies.

## Chapter 5 – Tool usage and refinement

### How the case studies have been approached

This research cycle is intended to answer RESEARCH QUESTION 3 regarding insights into capital allocation decision-making arising from the case study candidates conceived in Chapter 4, and to further develop the tools formulated under RESEARCH QUESTION 4.

Having generated the CARD through past experiential learning and the theories and approaches of both the academic and practitioner literature, this research cycle aims to test the utility of the CARD as a reflexive tool in generating new knowledge using the financial data of real and in most cases well-known businesses, and in doing so to stimulate the ongoing development of the CARD, Monte Carlo tools and the case study methodology.

As explained in Chapter 3 I am using case study methodology as a way of developing knowledge within the context of real businesses (Flyvbjerg 2011) supplemented by microanalysis (Strauss and Corbin 1998) of company annual reports and other information such as collaboration with my learning set on various websites and other information in the public domain.

In approaching each real-world case study I have followed these steps:

1. Several years' audited data input on each case study into the CARD, including references by way of comment field footnotes where I have cited management or press commentary.
2. Quantitative analysis using the metrics developed in the Chapter 2 literature review.
3. Qualitative analysis of management commentaries and notes to the accounts loosely following Strauss & Corbin (1998).
4. Triangulation against cash flow data, time series trends, fluctuations in management estimates of depreciation and amortisation, discussions with management where possible.
5. Reflection on:
  - a. what the analysis reveals about historic capital allocation
  - b. how the case study compares to others and to the literature findings
  - c. whether this provides any subjective predictive insights

- d. revisions to the tools
  - e. relevance to the research questions.
6. Narrative summary.

In the interests of word count I here include only the narrative summary findings. However the underlying data is available and I am happy to talk to it at the viva voce.



## Abcam PLC

Abcam was selected as it was highly recommended on the two website forums I used for this research. Abcam is an Alternative Investment Market listed company headquartered in Cambridge, UK with offices in the US, Japan and Hong Kong serving an international customer base. It sells a catalogue of 63,010 antibodies and related information products<sup>17</sup> for medical research purposes, which it either produces inhouse or sources externally. Abcam has been growing profitably without borrowings to such an extent that cash is the largest item on its 2010 balance sheet. I discussed Abcam's products with general medical practitioner Dr Stephen de Wilde<sup>18</sup> who confirmed Abcam's antibodies were well known amongst National Health Service professionals.

Return on capital employed exceeded 20% each year making it one of the highest among all the case studies and exceeding Slater's recommended target (Slater 1998). Buffett regards anything above 12% as acceptable (Schroeder 2008). However the share price has risen accordingly and pushed the price-to-earnings ratio to 24.8, the highest among the case studies. So while the accounting data reveals Abcam's success in generating profits, the market price data reveals Abcam is an expensive asset to buy. My colleague inside the NHS observed that Abcam's products were known to be expensive, which corresponds with the above margin findings, and that cost pressures on the NHS are likely to result in lower sales going forwards.

As shown in Chapter 4 the CARD is designed to penetrate segment data, unlike any of the publicly available databases. Illustrating the challenges of multi-year segment analysis, Abcam changed the basis of their segment reporting by aggregating countries differently from that in prior years and by variously including or excluding sales and costs data thereby preventing the calculation of country margins for all years.

Abcam has consistently paid a rising dividend. Also of note is the strong dividend cover, which in turn is reflected in a rising cash balance on the balance sheet (£40m as at 30 Jun 2010). The question arising from this is what is to happen to the surplus cash Abcam continues to generate? Accumulating cash can present temptations to management

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<sup>17</sup> Abcam PLC annual report 30 Jun 2010.

<sup>18</sup> London 20 February 2011.

through acquisitions for the sake of gaining organisational size or increasing their own remuneration (Buffett 1977-2012).

In conclusion, Abcam's accounting data is positive with a commensurate optimistic share price. There is the possibility of further growth especially from China with its large population. On the basis of the research I would conclude that Abcam's uncertain future growth characteristics might make it a buy under Slater's growth criteria (Slater 1998) but its short track record and high price relative to other opportunities would probably exclude it from consideration under the criteria of Graham (1976) and Buffett (1977-2012).

## Aero Inventory PLC

Aero Inventory was a London Stock Exchange listed company which went into administration in 2009.<sup>19</sup> It was selected as a case study to provide learning points in tell tale signs of impending disaster. Aero Inventory offered a service to global airlines by acquiring and managing their inventories. The business concept was that by acquiring and then consolidating aircraft inventories at international airports, Aero Inventory would be able to manage an aggregate inventory for all airlines more efficiently than if the airlines managed their own inventories. The company appeared to execute this strategy profitably, and it was favourably highlighted in the media including Investor's Chronicle<sup>20</sup>.

The return on capital employed at below 10% suggested the business was profitable but not outstandingly so and it was below Slater's recommended target (Slater 1998). However the return on equity appeared much higher at around 20%. This is because the return on equity is calculated after lenders have been paid, the residue belonging entirely to the shareholders. The CARD showed this was a false signal as the accounting earnings did not correlate with cash flows.

The CARD revealed further anomalous metrics. The rising dividend, attractive yield and good dividend cover suggested Aero Inventory was in a position of strength. It was only by cross-checking against the cash flow statement that the capital allocator would see that this company had been paying dividends out of borrowings instead of profits.

Ostensibly it appeared to be an attractive company in which to invest, which probably explains why it was recommended by Investors Chronicle. But by including the cash flow statement in the CARD analysis it was clear that the company was actually absorbing cash rather than generating it. Although the company appeared to have rising sales and profits, free cash flow after taxes and investment was negative and worsening. This shows the vulnerability of accounting earnings measures and importance of cross checking to the cash

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<sup>19</sup> Raman, PN 2009, 'UPDATE 1-Aero Inventory calls in administrators', Reuters, 11 November 2009, <http://www.reuters.com/article/2009/11/11/aeroinventory-idUSBNG18926120091111>, viewed on 25 December 2011.

<sup>20</sup> 'Easy pickings', Investors Chronicle, 24 June 2008, <http://www.investorschronicle.co.uk/Columnists/BearBull/article/20080624/a474b17e-41cd-11dd-a236-0015171400aa/Easy-pickings.jsp> viewed on 6 May 2011.

flow statement, an omission from the DuPont model (Soliman 2008). This functionality has been built into the CARD.

How did management, the accountants and even the auditors Deloitte & Touche manage to present such misleading accounts? By debiting expenses that should have gone to the profit and loss statement to inventory on the balance sheet (also a debit) the company both increased its profits and enhanced the strength of its balance sheet simultaneously. From my audit experience I would have expected Deloitte & Touche to have spotted the inflated value of inventory when they did their audit. This became a matter of investigation into Deloitte & Touche by the Accountancy and Actuarial Discipline Board.<sup>21</sup>

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<sup>21</sup> Sibun, J 2011, 'Deloitte's role as auditor to Aero Inventory under investigation', The Telegraph, 4 March 2011, <http://www.telegraph.co.uk/finance/newsbysector/supportservices/8360460/Deloittes-role-as-auditor-to-Aero-Inventory-under-investigation.html>, viewed 25 December 2011.

## British insurers Amlin PLC and Aviva PLC

Two companies in the same sector were analysed for this case study: Amlin and Aviva. Amlin provides motor, property, marine, aviation and liability insurance to commercial customers and worldwide catastrophe reinsurance to other insurance companies. Aviva provides life insurance alongside related investment products such as pensions and long term investments.

The business model of insurers is to collect premiums in advance, invest this float of money and pay out claims in arrears. Because the cash inflows precede the cash outflows the skills necessary to make this succeed are firstly appropriately priced underwriting of risks and secondly the achievement of good returns on the insurance float until it is paid out. The nature of the insured risks can vary and typically involve assessments of accident, mortality, natural disaster and unforeseen risks. I discussed the methodology used by insurers to achieve this with an insurance executive at commercial insurance broker Marsh<sup>22</sup>. He informed me insurers typically use a risk matrix approach populated through consultation with client management.

Insurers use the claims ratio to measure from year to year how much was paid out in claims versus how much was collected in premiums. This time delayed business model means it can take years to evaluate whether or not an insurance business is successfully run as it may be years after a premium was collected before a claim associated with that premium is paid out.

The two insurers' claims ratios differ significantly. Amlin has consistently collected more in premiums than it has paid out in claims. By contrast, Aviva has in most years paid out more in claims than it has collected in premiums. Therefore while Amlin has two sources of profitability, being insurance premium profits and float investment profits; Aviva has been prepared to make a loss on insurance underwriting presumably to maintain market share.

Turning to comprehensive earnings, Amlin has maintained profitability in each of the past eight years, although it has endured volatility during that time.

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<sup>22</sup> Melbourne, Australia, 22 November 2011.

Because the CARD uses statutory accounting data, a key insight emerged when analysing Aviva. Aviva have used a modified basis of accounting defined in the following terms:

“Operating profit before tax based on longer term investment return before amortisation of goodwill, amortisation of acquired additional value of in-force long-term business and exceptional items”<sup>23</sup>

Using this accounting basis, Aviva was able to exclude amortisation costs and investment losses considered by Aviva’s management to be atypical of long-term investment returns and in doing so they were able to describe a statutory loss for 2002 of £282m as a headline profit of £1,296m<sup>24</sup>. It was the £282m loss which was validated by the auditors, not the modified profit figure generated by the directors. Symptomatic of the agency problem between management and shareholders (Jensen and Meckling 1976), executive directors were awarded six-figure bonuses in 2002 despite the statutory loss<sup>25</sup>. This kind of behaviour by management triggers warning bells for the capital allocator, again showing the value of the CARD as a tool for reflecting on what the accounting results are really telling the reader.

Since 2003 Amlin’s return on capital entrusted to management is significantly higher than that achieved by Aviva’s management. Despite its status as a FTSE 100 company, this case study shows Aviva has a poor track record and is showing no signs of improvement. Aviva’s 1% return on capital employed is one of the lowest returns in the case studies. The capital employed, or in other words gross assets, amounted to £370,107 million as at 31 Dec 2010, mostly representing the insurance float. With such a large amount to invest, Aviva’s 2010 comprehensive income after tax of only £2,950 million is not impressive compared to Amlin and the other case studies. Aviva’s 2010 price-to-earnings ratio of 3.8 is lower than most of the other case studies and suggests the market has discounted Aviva’s business model, which we have learned is reliant on investment returns to make up insurance losses.

While Aviva’s track record in making sizeable profits appears attractive at first glance, deeper analysis reveals a company whose main insurance business operates at a loss in most years and whose results are masked by unusual accounting policies. Aviva is reliant on

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<sup>23</sup> Aviva PLC, 2002, Annual report and accounts, page 50.

<sup>24</sup> The transformation of a loss into a profit is reconciled on page 50 of the 2002 annual report and accounts.

<sup>25</sup> Aviva PLC, 2002, Annual report and accounts, Directors remuneration report, page 38.

secondary income sources such as commissions and investment returns to make up the shortfall in its insurance underwriting. But even those returns represent a very low return on the entire capital base, amounting to a mere 1%. The continuous payment of dividends even in bad years might give the appearance of profitability, but the underlying business model appears vulnerable to poorly priced risk and poor investment returns.

## Berkshire Hathaway Inc

Unlike the other case study companies which focus on operating within a particular sector, Berkshire Hathaway operates across a diversity of sectors including insurance, banking, railroads, electricity utilities, manufacturing, furniture retail, groceries, aircraft leasing and others.

The company has been consistently profitable yet has not paid a dividend over its four decades existence. It's 82 year old executive chairman, Warren Buffett, and 88 year old deputy chairman, Charlie Munger, have been in place since 1964 (Schroeder 2008). Each year since 1977 the chairman has written a several page narrative to shareholders reflecting upon the prior year's fortunes and misfortunes, all of which are available at [www.berkshirehathaway.com](http://www.berkshirehathaway.com) and which were included in the Chapter 2 literature review.

While the company has been consistently profitable overall, I could find no commentary about the results of its individual businesses. Therefore one of the aims of this case study was to test the CARD's usefulness in deriving knowledge from Berkshire's segmental data. The results were more revealing than initially expected.

Throughout the economic cycles, this company has not shown a loss. As profit can be manipulated by accounting policies, the cash flow from operations can serve as a check on profitability: but the dataset back to 1991 shows that cash flow from operations has also been positive in each year without exception. As a result of continued profitability and the non payment of dividends the balance of cash on hand has shown a rising trend except in years when the company has chosen to invest its cash into new businesses.

Segmental analysis is limited to the segmental data the company chooses to reveal which in turn creates a significant epistemic limitation on the analysis. In Berkshire's case the segments across which the company operates are particularly diverse, and the segmental data is highly summarised. Mitigating that, the segment breakdown has been consistent from year to year.

The segmental data illustrates the proportion of each business line making up Berkshire's entirety. As a proportion of total revenues, Rail and Utilities have increased from 1% of revenues in 2005 to 19% in 2010. While there has been no significant business disposal



during this period, Berkshire has acquired assets in both rail and utilities in an apparent adaptation of strategy towards those sectors.

Turning to the profitability of each sector it was surprising to see that the insurance businesses do not generate much profit and in some years have been close to break even. Given that the period 2005 to 2010 has not seen any particularly significant catastrophes, I had expected to see Berkshire's insurance businesses, which include reinsurance and "super cat", making profits while it builds up its reserves in the good years. If there is a year of super catastrophic events in multiple geographies, Berkshire may be exposed to significant losses. Berkshire's vulnerability to occasional insurance catastrophes may explain its diversification into other sectors.

Turning to the Sales and Services segment, which is made up of See's Candy, aircraft leasing, jewellery retail, household furniture, carpet and others (another of Berkshire's diverse portfolios), both sales and profits have risen steadily at an unremarkable 7% to 11% margin. Perhaps this provides a clue about Berkshire's success: the businesses to which it allocates its capital do not have to be remarkably profitable as long as they can produce a rising flow of sales at modest margins.

Berkshire's Rail and Utilities sector is mostly comprised of its investment in Burlington Rail. It is also a sector in which I have several years' international risk management and internal audit experience at London Underground in the UK and Metro Trains Melbourne in Australia. Combining my own experiences with what I read in Berkshire's financial statements, I would observe that rail transport requires enormous investment in infrastructure, but once made it becomes a permanent fixture to the local economy, community and environment. Rail also tends to benefit from government support irrespective of the prevailing political ideology. As a result rail can hold local monopolistic power making it potentially an ideal investment. On the other hand the weaknesses of rail include the need for ongoing maintenance and vulnerability to industrial relations. In its segmental reporting Berkshire has unhelpfully combined its utility businesses, mostly comprising US electricity distribution, with its rail business making it impossible to split them for separate analysis. Over the past five years Rail and Utilities has shown rising revenues and profit margins ranging from 13% to 21%.

Revenues and profits in Financial Services and Investments reveal high margins averaging 68.6%<sup>26</sup> which is generally consistent with the observations of Welch (2005) at General Electric. Dissecting the financial statements further we find that lurking in the 2008 Changes in Shareholders' Equity there is a huge USD\$23,342 million loss on the devaluation of investments. Because the CARD is designed to measure profitability through changes in equity not just the reported profits in the Profit and Loss statement, this write-down has the effect of converting Berkshire's reported profit into a significant loss for 2008. To my knowledge having followed the press on Berkshire throughout this period, this loss has not been picked up in the media. This illustrates the practical value of the CARD in helping to generate original and useful insights beyond what is available elsewhere.

Mitigating this loss, Berkshire does not appear to have had investments in the banks and insurance companies which collapsed in 2008 and 2009. Prior to that it also sidestepped devastating losses in the dot-com bubble of 1999 to 2001, and further back the Asian Financial Crisis of 1997.

When we bring together the disparate business segments Berkshire is involved in, the individual segment fluctuations are smoothed out. Although this conceals the segment results, it shows the overall result aimed for by management's individual asset allocation choices. Berkshire has consistently generated higher returns than the average UK investment trust as shown in Chapter 1 Trustnet data. This is the challenge Malkiel (2006) does not address adequately: that reflective market participants can consistently outperform.

We now turn to consider how these returns measure up to the capital required to generate them. The Return on Average Capital Employed for Berkshire is comparable to the other case studies. The negative result for 2008 reflects the sizeable write-down on its investment portfolio.

For a company which portrays itself as risk averse debt leverage is around 50% of total capital employed. However in Berkshire's case this is not debt funding in the usual sense. Looking closely at the balance sheet we find the debt relates to insurance losses which are

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<sup>26</sup> Taking a simple average calculation as  $\frac{(13,528 + 12,128 + 15,591 + 4,249 + 13,766 + 13,820)}{(3,691 + 3,924 + 4,082 + 4,002 + 3,649 + 3,617)} = 68.6\%$  which is considered sufficiently accurate for the purpose of this analysis.

owed to policy holders largely based on estimation rather than actual outstanding claims, unearned premiums and accounts payable to suppliers. All of these sources of funding are nominally free of interest expense and will be paid out in the ordinary course of business. Only around 10% of the debt ratio relates to interest bearing debt. The holding company does not hold debt in its own name. Instead it consolidates debt which has been taken on by its various subsidiary companies.

Turning to the agency problem (Jensen and Meckling 1976), Berkshire tackles this issue in a significantly different way to the other case studies.

Getting director ownership and remuneration data for Berkshire was not as straightforward as for British companies where it is a standard inclusion in the annual report. For US companies "Executive compensation" is disclosed in the annual Form 10-K submission to the Securities and Exchange Commission, but even here there was no data for Berkshire. Instead the data was cross-referenced from the 10-K to another SEC filing unhelpfully labelled "Definitive notice and proxy statement schedule 14A information" which I accessed through the US Securities and Exchange EDGAR system. Not that Berkshire had anything to hide regarding director remuneration. This filing showed that both Buffett and Munger each earned a salary of only USD\$100,000 per annum, extremely modest by comparison with the other case studies. Chief Financial Officer Marc D Hamburg received an annual salary of between USD\$612,500 in 2005 and USD\$912,500 in 2010, which although higher than his boss is not outlandish compared to the Chief Financial Officer salaries of the other case studies. The remaining non-executive directors, which include Microsoft's Bill Gates, each received an extremely modest USD\$2,700 per annum throughout the period reviewed with no increase from year to year. Share ownership amongst board members was particularly high, with the board owning just under one third of the company making it the highest proportion of ownership by management in all the case studies. With comparatively low salaries and comparatively high share ownership it would appear that management's orientation is towards shareholders rather than excessive management remuneration.

Berkshire stewards most of the Buffett and Munger family fortunes (Buffett 1997). Yet Berkshire Hathaway is a public listed US company in which anyone can invest. Management even go to the extraordinary length of charging only negligible salaries presumably as a way

of demonstrating their willingness to share the company's fortunes alongside the shareholders, making Berkshire unique among the case studies.

Yet the company's returns were average across the sample of case studies, with the insurance business operating at break-even, in contrast to the strong claims ratio of Amlin. In addition to its modest profitability, Berkshire remains vulnerable to super-catastrophe insurance claims in the event of major natural disasters. Offsetting that is the diversity of its business model which Buffett assures his shareholders will be able to absorb one-off mega-insurance claims (Buffett 1994).

## **British commercial property British Land Company PLC, Land Securities PLC and TR Property Trust PLC**

Having worked in the UK commercial property sector since 1998 and maintained links with former colleagues I have some insights into how this sector works, so I can bring at least a partial inside viewpoint to the three companies of this case study. In addition to the analysis of the annual financial statements using the CARD, I can also bring to this analysis the many meetings I have had with management from British Land, Land Securities and TR Property Trust.

Typically property assets, say office buildings or retail shopping centres, are purchased and then developed further through demolition and rebuild, acquiring and developing adjoining land and similar strategies. It can take years to build or develop new assets. Tenants take up occupation on long leases of typically 10-20 years with responsibility for maintaining the property, director or parent company guarantees if the tenant defaults and five-yearly upward-only rent reviews. Mostly tenants pay their rent quarterly in advance. Through these mechanisms risk is tilted in the landlord's favour.

British Land is a listed commercial property company with over £7 billion mostly UK commercial properties owned and managed either directly or through joint venture structures. Where Land Securities differs from British Land is that Land Securities has a more diversified, albeit UK-based, property portfolio; and it has historically used less debt leverage. TR Property Trust is a UK listed investment trust specialising in commercial property in the UK and continental Europe. As such its returns data was included in the Trustnet research carried out in Chapter 1 where TR Property achieved a creditable 9% average annual return over the ten year period 2002 to 2011, compared to 0.42% average across all UK listed investment trusts in the Figure 1 Trustnet data. Its assets consist of both investments in commercial property companies as well as a portfolio of office buildings around London. Since 1985 TR Property Trust has been managed by Chris Turner who I met numerous times at the trust's annual meeting of shareholders and who agreed to be interviewed in London on 5 August 2010 as part of researching this case study.

What stands out in the CARD data are the significant losses in 2008 and 2009 and lower profits thereafter. As all the figures have been compiled using IFRS they include not just

rental income but also changes in the capital value of the property portfolio as estimated by property valuers using guidelines issued by the Royal Institution of Chartered Surveyors (RICS). When sector values were increasing year-after-year this impacted favourably on profits. But the losses in 2007 and 2008 arose from significant decreases in the value of commercial property as valued under RICS rules based on sales of similar properties at the time. Comparative sales vanished at the onset of the credit crunch phase of the Global Financial Crisis (Roubini and Mihm 2011). While Taleb (2007) would call this a “black swan” event, I would suggest it is more pedestrian: values go down as well as up. As commercial property sales at that time were of distressed properties, the value of commercial property across the sector dropped significantly, even though most commercial properties were not for sale. The reality, as confirmed in my visits to some of the properties and meetings with management at the time, was that the properties remained let to tenants on long leases and those tenants continued to pay their rent. The logic of how risk is managed in commercial property in favour of the landlord, plus my visits to all three of these companies during the Global Financial Crisis, triangulate with cash flow from operations which remained positive throughout the entire period for each of the commercial property companies. In fact the data in the CARD which goes back to 1998 shows cash flow from operations consistently positive and never negative for any of the commercial property companies.

Given the slow and steady nature of the commercial property business and the financial security built into leases and guarantees that favour landlords, I would not have expected such volatility in asset prices. Effectively assets under management halved in value from 2007 to 2010 as shown in the data from each of British Land, Land Securities and TR Property Trust. At my 5 August 2010 meeting with Chris Turner of TR Property Trust, his view was that commercial property values had accelerated too much prior to the Global Financial Crisis when banks readily extended loans for commercial property buyers. When the availability of debt stopped in 2007, property values went suddenly into reverse as over-leveraged investors sold their assets at distressed prices in order to meet bank covenant requirements. A “black swan” (Taleb 2007) event? More likely a routine economic adjustment explainable as behavioural correction (DeBondt and Thaler 1985).

Having seen the effects of market risks, how much risk has each of the commercial property companies taken on in terms of its own debt leverage choices?

British Land has remained approximately 50% geared throughout the last five years, and this is consistent with the company's long-term strategy to use its relative safety to finance its assets through borrowings. Recalling Graham (1976) this would be the maximum gearing level he would have been comfortable with as it should ensure that once obligations to lenders are met there remains a reasonable profit for shareholders.

Historically Land Securities has taken a more conservative approach to debt than British Land and its other peers in the UK commercial property sector. This is consistent from my meetings with management at Land Securities over the years where I have observed the care they take towards risk management, as confirmed also by substantial voluntary disclosures of their risks in their annual report and accounts. The company's Risk Manager also manages internal audit and insurance thereby creating an in-house centre of excellence in risk minimisation, rather than allocating these responsibilities to different individuals where important risk information could fall between organisational gaps.

Going back further in the historic data, Land Securities only financed around 25% of its assets through borrowings. It was only since 2003 that Land Securities took the decision to allow its gearing ratio to exceed 30% and to increase its dividend payments to shareholders thereafter. When the Global Financial Crisis damaged the book values of its properties, arithmetic necessitated that the gearing ratio would rise above 50% - significantly above what Land Securities had tolerated historically. The company therefore sold assets, unfortunately at a time when asset values were depressed by market conditions, and reduced its debt back to 38.2%. This gives us an insight into the management culture at Land Securities: the corporate strategy is to keep debt levels well below 50%, compared to British Land who keep their debt levels at around 50%.

At TR Property debt levels have remained consistently low. In fact over the last ten years TR Property's debt ratio has never exceeded 20%. This reflects two things: firstly a desire to maintain low leverage and therefore low risk profile, and secondly recognition that TR Property already benefits from the gearing levels of its investee companies.

The Global Financial Crisis illuminated a previously unacknowledged vulnerability in the property sector: that property values are determined by comparative sales under the RICS Red Book valuation methodology, and if those sales are depressed for some macroeconomic reason as we saw in 2008-2009 then this will have a direct impact on sector-wide values.

Despite the halving of capital value the underlying rental revenues largely remained intact, which in turn meant the companies were able to continue paying dividends without interruption. This is in stark contrast to the banking sector, for instance, where dividends ceased at Lloyds Bank and Royal Bank of Scotland as we will see later. Had the commercial property companies prepared their accounts under UKGAAP instead of IFRS the capital losses would have gone less noticeably to the asset revaluation reserve on the balance sheet rather than to the income statement (although the CARD's analytical design would still have picked that up).

So how did this period of volatility impact on shareholders?

Because the financing strategy adopted by all of the commercial property companies involved financing through debt, the returns to shareholders have been even more exaggerated than the overall returns on assets. This is because, as is common to any business (or for that matter any individual) whose financing strategy is based on debt, obligations to lenders are paid first and shareholders later. As shown by Modigliani and Miller (1958) and Sharpe's Capital Asset Pricing Model (Sharpe 1964) this strategy works as long as the business makes returns which exceed the cost of debt. But due to the changed conditions arising from the Global Financial Crisis, after meeting obligations to lenders there was no profit, in an accounting sense, for shareholders. Interestingly all of the commercial property companies did in fact continue to pay dividends to shareholders throughout that period, because as we saw above the business models actually remained cash flow positive despite the fall in the book value of their assets.



## The Coca-Cola Company Inc

Started in 1892 and incorporated in 1919 The Coca-Cola Company manufactures and markets worldwide the Coca-Cola soft drink along with around 500 other non-alcoholic beverages including Sprite, Fanta, Schweppes and Minute Maid juices according to the 2010 10-K. As well as manufacturing base concentrates, syrups and finished products, the company also owns or controls, through share ownership or licensing agreements, a worldwide network of bottlers and distributors. Through this network the company constantly adapts its products to changing local tastes using sales data to determine appropriate discounting and manufacturing quantities.

In the 10-K the company estimates that 1.7 billion eight-ounce servings are consumed each day, which would roughly equate to a glass of one of Coca-Cola's beverages by one in three people in the world on a daily basis. Another insight gained from the 10-K is that Coca-Cola has accounted for 50% of sales by volume for each of the past three years. With a world population of approximately 7 billion, affordability and ready access to the company's products and the possibility of multiple servings per person per day, further market penetration would appear possible particularly in countries with large populations emerging from mass poverty. On an extended 11 month stay in China from Jul 2010 to May 2011 I made a habit of counting the number of Coca-Colas I saw being consumed when I went out. At first it was typically one Coke per day. But by the end I started seeing crates of Cokes being delivered to a favourite local dumpling restaurant. Interestingly I saw as much Pepsi being consumed suggesting the competition between Coca-Cola and Pepsi in China is fierce.

When converted at the then prevailing exchange rates, the retail price of Coca-Cola in China was about half the retail price I had observed in the UK and Australia, suggesting that future price increases may be possible subject to Chinese prosperity. The US parent company may also benefit if the Chinese Renmimbi Yuan were to rise relative to the US Dollar.

Given the homogeneity of the products, the most interesting insights can be gained from the geographic, rather than product, consumption trends which are disclosed in the 10-K as percentages. The problem here is that the segments described in the 10-K are not precise possibly due to the company's desire not to reveal information which could be of value to its competitor Pepsi. For instance we cannot isolate individual countries such as China, India

or Indonesia, which are all unhelpfully consolidated under “Eurasia and Africa”. On reflection, another problem is that sales will depend on the extent to which the parent company owns the local bottler. Sales to a bottler will consist of syrups and concentrates whereas sales by the bottler will include the finished product wholesale price to the retailer. Cost trends are affected in the same way. So the acquisition of the North American bottler Coca-Cola Enterprises during 2010 has a noticeable impact on the surge in the 2010 sales composition but does not necessarily reflect an increase in price or volume of the end product. In the 10-K management call this “structural changes”. Once again I am alerted to the epistemic limitations of reported segmental data and the depth of reflective research required in order to understand the sales trends across time, products and geographies. I am left wondering how well equipped are readers of financial reports if they do not understand the intricacies of accounting and how it can be used to convey or conceal useful information?

In aggregate, then, how do Coca-Cola’s returns measure up?

In most years the return on capital employed has exceeded 20%, which would suggest the company is more efficient than most others in these case studies at converting its capital investment into profits. The one exception was 2008 when a drop in profits was exacerbated by a \$972 billion pension write-down at the onset of the Global Financial Crisis, consistent with the blips we have seen in the other case studies.

Coca-Cola’s return on equity figures are among the highest in the CARD. After meeting its obligations to lenders, the shareholders of Coca-Cola appear to be making returns around 50% per annum. We will consider below how much of this is paid out as dividends.

The price-to-earnings ratio tells us that an investor looking to buy shares at the current market price would be paying only around 13 times last year’s earnings. As seen in the CARD this has been showing a declining trend since 2000 when it was 51 times earnings. The fall in the price-to-earnings ratio suggests the company has fallen out of favour with investors, although we can only speculate why this might be. It could be the homogeneity of its products. Or the global saturation already achieved. Or fears that it might lose customers to Pepsi. Whatever the reason, the share price is cheaper in relation to the company’s earnings at the time of writing than it was ten years ago.

So how have Coca-Cola's shareholders fared?

The dividend has been rising year on year and, except for the pension deficit in 2008, has remained at over two times earnings in most years. In fact going back further the dividend has increased year on year by 6-14% per annum since 2001, suggesting management's ongoing confidence in the company's ability to continue generating profits from which to pay dividends.

We now turn to consider how much risk management have chosen to take on in terms of debt leverage.

Shareholder equity has been increasing year on year due to retained earnings as evidenced by the balance sheet. In addition the company more than doubled its debt level in order to acquire the US and Canadian bottler Coca-Cola Enterprises in 2010. As a result gearing rose to 42.8%, the highest it has been in the CARD dataset going back to 2000.

The executive directors of Coca-Cola are among the highest paid in the case studies. One of Coca-Cola's non-executive directors was Warren Buffett, chairman of Berkshire Hathaway. According to Berkshire Hathaway's 2010 10-K, Berkshire owns 200 million Coca-Cola shares having begun purchasing those shares shortly after the 1987 global stock market crash.

Buffett (2010) commented specifically on Berkshire's Coca-Cola shares in the following terms:

"Coca-Cola paid us \$88 million in 1995, the year after we finished purchasing the stock. Every year since, Coke has increased its dividend. In 2011, we will almost certainly receive \$376 million from Coke, up \$24 million from last year. Within ten years, I would expect that \$376 million to double. By the end of that period, I wouldn't be surprised to see our share of Coke's annual earnings exceed 100% of what we paid for the investment. Time is the friend of the wonderful business."

## Livingwood Properties

Livingwood is an unincorporated private business I started in 2001 to invest in residential real estate in Australia. Initially financed with 80% bank borrowings and 20% personal equity, the business purchased seven residential properties and converted some of them into flats. Although much smaller than the other case studies, its role here is to bring my intimate inside knowledge into play to test whether there are any significant gaps in the CARD design.

In all years going back to 2002, the first full year of operation, the business has consistently been profitable and rents have risen 5-10% per annum. Modest but consistent profitability has also been due to the business benefiting from strong tenant demand, a lumpy but upward-only increase in capital values and a rise in the Australian dollar against a fall in Sterling.

At around 8% the return on capital employed has been unremarkable relative to the other case studies, albeit positive. As the business has been geared with bank borrowings the return on equity has shown volatility. Increases in interest rates over 2007 to 2008 by the Reserve Bank of Australia had the effect of depressing the return on equity. As an insider I can report that this period was valuable in setting a culture of financial discipline and frugality that remains in place at the time of writing.

The debt ratio is only around 45% whereas the business commenced with 80% debt in 2001. The reason for this is that over the past ten years the asset values have increased to such an extent that the initial debt financing now represents a lower proportion of the total capital employed. This favourable trend would go into reverse if the assets were to fall in value as we saw in the British commercial property case study and as implied in the cost of capital of Modigliani and Miller (1958).

Livingwood has been a beneficial experience in owning and managing my own business. Although profits have not been outstanding when compared to the other case studies, in the context of the oscillations and general collapse in other markets over that time Livingwood has maintained year on year profitability throughout the Global Financial Crisis.

Testing my knowledge as an insider to the insights generated using the CARD has shown that the metrics in the CARD are useful for examining the accounting numbers. Running Livingwood has helped me to understand why Buffett (1977-2012) likes to buy profitable owner-managed businesses: they tend to be run with both passion and care reflected in attention to detail and risk management. Livingwood also lacks the bureaucracy I have experienced at nearly every employer and client throughout my career. But having said that, the CARD results clearly show that at least some of the other case studies are significantly more profitable in return on capital and return on equity than Livingwood, which could imply that the rational thing to do would be to liquidate Livingwood and allocate the capital to those companies with better track records. The CARD helps in throwing a spotlight on those kinds of capital allocation decisions.

## British banking sector Lloyds Banking Group PLC and Royal Bank of Scotland Group PLC

Lloyds and RBS are UK based retail and wholesale banks with subsidiary businesses in some international markets and in insurance. Their primary business is the provision of retail and commercial banking, being both deposit accounts and a variety of loans including mortgages, credit cards and short term loans to retail and commercial customers under a variety of brand names.

The CARD shows both banks routinely lend out more than they hold in customer deposits. The excess lending is made up through wholesale borrowing from other banks. This is what creates interdependencies between the major banks and why the entire sector was at risk of systemic failure during the Global Financial Crisis<sup>27</sup> (Roubini and Mihm 2011). For both banks the loan-to-deposit ratio deteriorated during the Global Financial Crisis as calculated in the CARD. The significance of this is that additional wholesale funding was needed to the extent that loans exceed deposits at a time when funding became harder to achieve due to the Credit Crunch. If Lloyds and RBS can reduce their loan-to-deposit ratios over time, it will correspondingly reduce their reliance on wholesale funding. Progress towards this goal features prominently in their annual financial commentaries.

Both banks made poor acquisitions resulting in both requiring government support in 2008/9.

From the 2009 and 2010 annual reports we see that in 2009 Lloyds took over Halifax Bank of Scotland Group PLC (HBOS)<sup>28</sup> which had invested in the now infamous US residential mortgage-backed securities and poorly collateralised foreign loans in Ireland. Consequently following the HBOS acquisition Lloyds became dependent upon support from the UK government in the form of an injection of equity capital, the Government Asset Protection Scheme and a Special Liquidity Scheme for wholesale funding. Falling short of full nationalisation, at the time of writing Lloyds was 40.56% owned by the UK Government, the

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<sup>27</sup> For example 'Systemic failure in investment banks', Financial Times, 15 September 2011, <http://www.ft.com/cms/s/0/278b0d8c-df97-11e0-845a-00144feabdc0.html#axzz1hW5H9fp9>, viewed on 25 December 2011.

<sup>28</sup> Widely covered in the media at the time for example Randall, J 2008, 'What's wrong with Lloyds' takeover of HBOS? Just follow your nose', The Telegraph, 11 November 2008, <http://www.telegraph.co.uk/finance/comment/jeffrandall/3442788/Whats-wrong-with-Lloyds-takeover-of-HBOS-Just-follow-your-nose.html>, viewed on 25 December 2011.

bank paid £2.5 billion in fees to the Government under the Asset Protection Scheme and Lloyds remained reliant on funding under the Government's Special Liquidity Scheme.

As a result of its 2008 takeover of ABN AMRO, RBS required emergency funding in order to avoid bankruptcy, which led to HM Treasury injecting equity capital, wholesale funding support and insurance again by way of the Government Asset Protection Scheme. The latest audited accounts show that RBS is now 82% owned by HM Treasury. The chief executive at that time, Sir Fred Goodwin, was terminated, de-knighted and was vilified in the press for his role in RBS' near-bankruptcy.<sup>29</sup>

Lloyds stands out among the case studies as showing considerable balance sheet volatility. The CARD has been populated with Lloyds data going back to 2000 since when Lloyds has shown net profits before tax of around £3 billion to £4 billion per annum so the sudden drop to £807 million for the year ended 31 Dec 2008 was noticeable. In the 2010 annual result management repeatedly made the claim of having "returned to profitability" when in fact they reported a loss in the Consolidated Income Statement. This anomaly is due to Lloyds' "combined business basis" of accounting under which one-off transactions are regarded as having occurred in the distant past. The 2009 profit was helped by a one-off gain on the acquisition of HBOS without which the CARD shows a £10 billion loss would have been reported otherwise. In hindsight following the impairments of HBOS's assets it would seem the acquisition gain has been reversed by subsequent impairment losses.

Following the £17 billion loan book impairment charge in 2009 the then CEO Eric Daniels reported that "impairments [are] expected to reduce significantly in the coming years"<sup>30</sup> when in fact there was a further £11 billion impairment charge in 2010 and yet another £5.4 billion in the 2011 Interim Report and Accounts.

Lloyds has surprised on the downside and one is left wondering if there will ever be a return to the steady profits that Lloyds produced prior to the Global Financial Crisis.

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<sup>29</sup> Recent press coverage on Sir Fred Goodwin includes '25 people to blame for the financial crisis', TIME, [http://www.time.com/time/specials/packages/article/0,28804,1877351\\_1877350\\_1877328,00.html](http://www.time.com/time/specials/packages/article/0,28804,1877351_1877350_1877328,00.html) viewed on 25 December 2011.

<sup>30</sup> Per Chief Executive's review in the 2009 audited annual report and accounts.

Similarly, RBS has reported losses for the past five years. In the 2008 Group Chief Executive's Review: "In 2008 the Group's overall results were bad". It was mainly attributable to £8 billion loan book impairments and £33 billion acquired goodwill write-downs on ABN AMRO and other acquired businesses.

Lloyds shareholders have suffered in terms of a 90% decline in the share price since 2007, a large rights issue in 2010 under which shareholders were requested to pay in more capital, and all ordinary and preference dividends have been suspended with no date at the time of writing for their reinstatement.<sup>31</sup>

Similarly the CARD showed that RBS shareholders were beguiled into seeing RBS shares as a good buy prior to the Global Financial Crisis. As well as an excellent dividend yield, RBS dividends were strongly covered by earnings. Additionally the annual reports from 2006 and earlier disclose how RBS was a prize-winning bank. But following the Global Financial Crisis RBS shareholders have suffered in terms of a 98% decline in the share price. In addition ordinary dividends have been suspended since 2008 with no date as yet for their reinstatement.

Reflecting on this point, if the accounting data and press coverage were both positive prior to the Global Financial Crisis, would the CARD have helped in identifying the impending crisis, as it did in the case of the Aero Inventory case study? In answering that question, the CARD does highlight debt leverage and by implication the inability of the banks to cushion losses.

The accounting data shows high debt ratios exceeding 90% for the banks well above the maximum 50% recommended by Graham (1976), which for most businesses would be considered imprudent. However in the banking sector it is not unusual. By way of comparison, as at 31 Dec 2010 HSBC's debt ratio stood at 94% and Barclays at 95%<sup>32</sup>.

The notes to the accounts also show that both Lloyds and RBS have exposure to sub-prime lending in Ireland (in the case of Lloyds) and the US (in the case of RBS), comprising

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<sup>31</sup> Wilson, H 2011, 'Lloyds dividends at risk after £3.9bn loss', The Telegraph, 8 November 2011, <http://www.telegraph.co.uk/finance/newsbysector/banksandfinance/8877584/Lloyds-dividends-at-risk-after-3.9bn-loss.html> viewed on 25 December 2011.

<sup>32</sup> Per their 2010 audited annual report and accounts in both cases.



borrowers with past loan repayment failures, high loan-to-value ratios and poor credit ratings. That is, borrowers who would not be lent to by a cautious lender. That established and presumably prudent major UK banks would lend to such borrowers reveals the sector's group-think, as warned of in Emmanuel *et al* (2010). By contrast, bank funding is sourced from customer current accounts, savings accounts and short term wholesale funding. This does lead to a maturity mismatch between long-maturing assets and short-maturing liabilities. This will require daily management attention to ensure a continuous inflow of short-term borrowings.

On the Interactive Investor bulletin board one poster, by the name of Alphonsorio, who I blogged with lamented the pain of old age pensioners he represented who had invested significant savings in Lloyds on the grounds of its historically stable dividend. As shown in the above data, from 2007 to 2008 those pensioners saw their capital value drop by 90% and dividends have ceased at a time in their lives when they can do little to generate replacement earnings. This is an emotive illustration of the ethical responsibility upon management to allocate financial capital prudently from year to year.

Are there any lessons to be drawn from Lloyds and RBS? A great deal has been learned about bank vulnerabilities and those lessons appear to have been incorporated into increased communication in the annual financial reports analysed for this case study. Additionally both banks have new chief executives. In recovering from a crisis, the new chief executive has the advantage of momentum that might not otherwise exist when the business is not in a crisis. The chief executive is better able to take tough strategic decisions such as closing down failing businesses, controlling salary increases, and terminating surplus staff at a time when all management, staff, suppliers and unions know costs have to be reduced. By looking across several years' data the CARD is designed to assist in analysing across changes in management and strategy over time.

While the CARD cannot always give a clear signal of impending doom, it did in this case highlight that the dangers of high leverage apply as much to banks as to other businesses. Lloyds and RBS are 95% funded by debt, significantly beyond Graham's recommended 50% maximum (Graham 1976). Even with a visible high street presence and prudent business

strategy, highly leveraged businesses are at risk of disaster in the event of a bad year, or a series of bad years as occurred here.

Therefore the CARD is a useful tool – but still only a tool – to aid the microanalysis needed to generate the insights to support capital allocation decision-making.

## Sage Group PLC

Sage produces and sells accounting software globally for small to medium sized enterprises. Sage applications are well known in the accounting industry and I used the Sage Line 70 system for a forensic consulting assignment at the English Sports Council in 2009. The system was user friendly and well supported. It is also popular amongst chartered accounting firms who use it on behalf of their clients, such as Sam Rogoff & Co in London. Competing products include CODA, JD Edwards, Ellipse, Oracle, and SAP all of which I have used throughout my career.

In addition to selling accounting software, the accounts show that Sage also sells ongoing maintenance, training and support services to its customers. These add on services are essential for accountants as changes to laws and regulations require frequent system updates, which in turn require ongoing training and user support.

Sage has been showing a rising trend in both profits and cash flows which is also reflected in an ever strengthening balance sheet. Cash flows consistently exceed profits due to Sage's practice of charging upfront for maintenance and support services. This cash flow has been used to pay down borrowings as can be seen from the reduction in long term financing from £562m in 2007 to £250m in 2010.

Sage sells to an international customer base across the above continents and sales are rising across all markets especially "Rest of World" segment. The Rest of the World category includes China, India, Saudi Arabia and Brazil<sup>33</sup> although individual country sales figures are not provided in the segmental disclosures.

Returns on average capital employed have been moderate compared to the other case studies although they do meet Buffett's 12% target (Schroeder 2008). Reflecting on this data it would appear Sage has not suffered from significant asset write-downs during the Global Financial Crisis as we saw in the banks, commercial property and Berkshire Hathaway case studies. The CARD shows Sage had another characteristic that helped shield it from disaster: It is not as reliant upon debt and therefore did not hit a funding crisis during the Credit Crunch as we will see in the Woolworths case study. In Sage we have a practical

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<sup>33</sup> Sage Group PLC 2010 Annual Report and Accounts page 12.

illustration of the resilience of low-g geared companies as favoured by Graham (1976) and Buffett (1977-2012).

It would seem from the CARD that management have been using cash to pay down debt rather than to make acquisitions or pay increased dividends. The debt ratio has consistently been fairly modest compared to the other case studies, yet management have reduced it to only 13.3%. That is a low level of debt compared to the other companies in this chapter, particularly the banks where we saw debt ratios around 95%.

A dividend yield of around 3% that is also covered two to three times by earnings would suggest management's confidence in cash flows. The dividend per share does not appear to be a growing trend, perhaps suggesting management's intention of holding back cash to repay borrowings or make new acquisitions.

The company's products are well known among accountants and appear to be selling across a diversified global client base. Sales and profits appear to be trending favourably. A low debt ratio and high cash generation suggests this company is unlikely to have liquidity problems. Analysis of the financial statements over a number of years suggests this company meets all the criteria recommended by Graham (1976) and Buffett (1977-2012) to warrant consideration by the allocator of financial capital. This could be the kind of company the CARD is intended to find as it seems to tick all the boxes with apparently low risk arising from its modest debt leverage.

## Woolworths Group PLC

Woolworths was a well-known retail chain which, according to their 2008 annual report, operated over 800 stores across the UK specialising in a range of low-priced non-grocery household items such as children's clothing, toys, pick-and-mix sweets, and household items such as DVDs, gardening and DIY tools. An inability to renegotiate borrowing facilities at the outset of the Global Financial Crisis saw the company go into administration in 2008.<sup>34</sup>

I have the additional advantage here of having worked with the then Woolworths Finance Director. We maintained contact when he joined Woolworths and he introduced me to Woolworths' Head of Corporate Finance and Head of Treasury. This did not provide confidential inside knowledge, but it did at least provide exposure to management thinking at the time, which I supplemented with the views of my learning set who blogged about Woolworths on the Interactive Investor website. Despite the declining trends, Woolworths engaged in a store refurbishment programme to revive sales and there was a sense of optimism that the company's fortunes could be restored, as summed up in the Chief Executive in the 2008 annual report: "Overall, across the group we believe we enter 2008/9 with the businesses strengthened relative to the prior year and well set up for the challenge ahead." Instead it went into administration.

Like Aero Inventory, Woolworths is included in the case studies to test whether the CARD design could potentially provide knowledge of the impending demise of the company.

The sales trend tells an interesting story: despite management's efforts to change the product mix and refurbish the stores, sales rose but not substantially. The decline in profits would suggest either a decline in profit margins or an increase in costs or both. The decline in profitability is also shown in declining cash flow figures. The CARD triangulates this with income tax payments which are another signal of profitability and show the same trend again.

Digging a little deeper into the notes to the accounts, the depreciation charge fell from £40.4m in 2007 to £29.3m in 2008 which would seem unexpected given that the company was incurring additional capital costs arising from its store refurbishment programme. As

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<sup>34</sup> Peston, R 2008, 'Woolworths set for administration', BBC News, 26 Nov 2008, <http://news.bbc.co.uk/2/hi/business/7751064.stm> viewed on 26 September 2011.

depreciation cost is subject to management estimation it could be that the rate of depreciation was reduced in 2008 to help reduce costs going through the income statement. If so this would be an example of creative accounting I had also seen employed at a client when I was asked to act as interim financial controller per my DPS4060. The CARD is designed to highlight such accounting techniques.

Another finding in the notes to the accounts was a £50m increase in intangible assets in 2007. With the benefit of hindsight it would seem that if anything the intangible value of Woolworths was in decline at this time, so capitalising costs onto the balance sheet as intangible assets could have been a way of diverting costs away from the income statement thereby inflating profits. The declining cash flow from operations is more likely to be telling the truth than the income statement.

The CARD shows Woolworths was making 4-5% return on capital employed, noticeably lower than the other case studies, for instance Coca-Cola where returns were around 25%. It tells us that of all the capital entrusted to Woolworths by shareholders and lenders, management were only able to generate low single digit returns even before tax had been paid. Capital allocators may as well put their money in a bank to earn a comparable rate of interest plus a higher degree of assurance that their capital will be returned.

The Finance Director's commentary on earnings per share shows the dangers of relying on the commentaries appearing at the front of annual reports:

“Adjusted basic earnings per share (which removes the effect of fixed rental uplifts, amortisation of certain intangible assets and exceptional items) was 1.4 pence per share against 1.2 pence per share last year.”<sup>35</sup>

What is made to appear as an increase in earnings per share in fact was not. The CARD's independent computation of earnings per share shows figures which are much lower than that. In any case, it is questionable whether the Finance Director's exclusion of rent cost uplifts, amortisation and exceptional items is even a valid way of describing earnings per share as these are real costs incurred by the company so should not be excluded when

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<sup>35</sup> Woolworths Group PLC 2008 Annual Report and Accounts page 16.

calculating earnings. The word-by-word microanalysis of Strauss and Corbin (1998) is warranted when reading company annual reports.

The CARD also shows that despite negligible earnings per share, management continued to increase the annual dividend payout to shareholders. Perhaps this was intended to signal management's confidence in the company's ongoing profitability. By 2008 dividends were not even covered by earnings.

The decline in the share price reflected the market's concern about future prospects which turned out to be valid, perhaps supporting the views of Fama (1991) and Malkiel (2005) about the Efficient Market Hypothesis. While the share price appears supported by the balance sheet, we have already seen that cash was in decline and intangible assets ascendant in 2007. So net tangible asset backing might be more relevant in this case.

In a conversation I had with the former Woolworths Head of Treasury after the company had gone into administration, she attributed Woolworths' demise to the inability to renegotiate borrowings, which was consistent with how the event was reported in the media at the time. However the above figures suggest this was more a case of a slow decline in sales and profits despite management's efforts to revive the stores and product mix. Perhaps Woolworths was unable to compete with the variety of household items increasingly sold at the major grocery chains such as Tesco and Sainsbury and at the discount chains such as Poundland. Should management continue to run a business when it clearly cannot compete in the market? Perhaps the right thing to do – at least as far as shareholders are concerned – might be to wind up the business in as orderly a manner as possible and return as much value back to shareholders as that allows. But from the board's perspective, finding an alternative well-paid directorship is not easy and the preferable route might be to continue running the failing business for as long as possible, which appears to have been the case here. The CARD can assist the capital allocator in seeing when management have chosen to continue trading despite declining profitability and cash flows.

## CRITICAL REFLECTION: Case studies

Returning to the research questions, the aim of this research cycle had been to address research questions 3, 4 and Malkiel's challenges from Chapter 2.

## CRITICAL REFLECTION: Capital allocation learnings

3. Using those case studies, analyse relevant historic and recent data in order to delineate incremental insights into capital allocation approaches and capture this in a way that can be used as an ongoing basis for learning.

Has the CARD succeeded in generating new insights? As Flyvbjerg (2011 page 303) points out and consistent with the exploratory methodology I am utilising, "sometimes we simply have to keep our eyes open and look carefully at individual cases – not in the hope of proving anything, but rather in the hope of learning something". The CARD has helped in generating new insights into a variety of challenges facing the capital allocator which have not been published elsewhere. Businesses are individually unique, far from homogenous as presumed in much of the literature, and that despite laws, regulations, corporate governance codes and the work of auditors, management can perpetrate and then conceal their abuses in a variety of ways. As we saw in the poor returns revealed in the Trustnet study in Chapter 1, capital allocation is difficult even for the professional investment community. The CARD aids in penetrating at least some of the epistemic issues facing the capital allocator.

The annual financial reports which provide the core data for analysing business performance are produced by management, the very people whose vested interest is to preserve their outsized remuneration sometimes with apparent disregard to shareholder losses as was seen in the insurance and banking case studies (also Roubini and Mihm 2011). The case studies show that management can do this through:

- providing optimistic commentaries, which invariably appeared at the beginning of the annual report and often in large sized font
- creative accounting under which I would include modified bases of accounting
- applying commercial pressure to the auditors who similarly wish to preserve their fees.



Therefore the odds may not favour the capital allocator who wishes to find the truth about a business's performance.

Using the CARD and associated tools knowledge was generated in several areas as follows:

- The CARD helped in seeing through creative accounting by:
  - analysis of net movements in equity rather than only relying on data in the income statement
  - ratio analysis that included existing DuPont ratios as well as new audit-oriented ratios variously correlating accounting and cash flow data as described in Chapter 4
  - analysing periods of time encompassing several years rather than the two to five years typical in the commonly available databases.
- Positive accounting ratios not supported by cash flows suggested the accountants and auditors were being creative in what they allowed to be capitalised as expenses (Aero Inventory, Woolworths). It could be counter-argued that I had the benefit of hindsight in both these cases. But I am reasonably sure there is sufficient analytical power in the CARD to spot these kinds of problems predictively before they happen. This would be of use to the capital allocator in avoiding companies at risk of impending bankruptcy.
- The CARD is sufficiently flexible that it can analyse businesses year-on-year as well as side-by-side with other businesses. This helped in generating comparative insights on the insurance sector, banking sector and commercial property sector case studies where differences in debt structure, returns on capital employed, dividend policies and so forth became apparent.
- Commentaries by the chairman, chief executive and finance director at the beginning of the annual report may provide a more glowing account of business results than the actual financial statements and notes to the accounts (Aviva, Lloyds Bank, Woolworths). Microanalysis of the company annual reports highlighted a number of anomalies at a deeper level than I have seen in the press commentaries on these companies. Aviva, Lloyds Bank and Woolworths had all tweaked their accounting policies in some way, the explanations of which were buried in the detail of the reports.

- The 2008 loss at Berkshire Hathaway was a revelation. The CARD generated this finding due to its emphasis on the movement in equity rather than merely relying on the profit and loss statement as was the case in all of the other publicly available databases.
- Related to that, the CARD was useful in helping to explore segment data, which was also not available in the publicly available databases. However there were difficulties arising from inconsistencies in segment disclosures as seen in Abcam, and opaque segment breakdowns as seen in Coca-Cola. The CARD's segment analysis was useful in gaining a better understanding of Berkshire Hathaway's diverse businesses.

While the CARD has proved itself in terms of these kinds of risks, the nature of risk is that the future may differ in significant ways from the past (also Taleb 2007). If there are new creative accounting techniques yet to be exploited, I would hope the CARD combined with reflective microanalysis will assist in detecting those before the event.

### **CRITICAL REFLECTION: Malkiel's challenges**

Recall from Chapter 2 that Malkiel (2006) would probably criticise any attempt to find value through analysing accounting data and would likely suggest a chimpanzee to allocate capital for us (Malkiel 2006). I have rejected this view on the grounds that it seems to place absolute faith in the strong form of Efficient Market Hypothesis.

However Malkiel's challenges are worth revisiting to ensure I have considered the objections of the most vocal opponent of fundamental analysis in forming this approach to capital allocation. Malkiel's challenges were as follows:

<b>Malkiel's challenges</b>	<b>How they have been addressed</b>
The information and analysis might be incorrect or may be based on flawed accounting data.	Several points of triangulation have been built into the CARD to ensure data accuracy.
Even if the researcher does identify an investment with a great past record of growth there is no guarantee that will continue into	This remains true. Therefore the case study approach includes qualitative analysis in addition to quantitative

the future. Even great companies like IBM, Apple, Microsoft, Xerox and so forth have a finite period during which they can make superior profits.	analysis. The practitioners recommend diversification (Graham 1972, Buffett 1977-2012, Harris 2005) albeit not mathematically defined.
The estimate of value may be faulty.	This could arise through data inaccuracy (addressed above) or through misplaced reliance on a single parameter, such as the price-to-earnings ratio. The approach adopted here uses multiple criteria for assessing value.
The fundamental researcher may have an embedded conflict of interest arising from an investment bank's clientele.	Although this might usually be the case as pointed out by Woolley (2010), those factors do not apply at Kelly Partners where we manage the partners' capital.
The actual price might never converge with its value.	Yes this remains a risk, although could seem self-contradictory to Malkiel to argue price non-convergence with value and simultaneously that prices are informationally efficient.

### **CRITICAL REFLECTION: How the analytical tools have been enhanced**

The other purpose of the case studies was to road-test the CARD tool and micro-analysis over a variety of sectors, geographies and time periods as aimed for in RESEARCH QUESTION 4.

4. From the above research into relevant literature and case studies, describe how the findings can be used to develop a new model which can be used to improve capital allocation decision-making and translate this into a knowledge based tool or suite of tools for use by my firm in providing value-adding client services .

In following this approach the CARD has proved useful as an interrogation tool to aid reflexive analysis of both quantitative data and qualitative information. What worked particularly well was the ability to analyse companies side-by-side for the same year under

study, or to review the progression of financial results from year-to-year. Due to the formulaic construction of the CARD, the data needed to support these types of analyses can be drawn from the database within seconds.

It was also pleasing that several accounting anomalies emerged where it was clear managements had modified their accounting policies over time or where they had attempted to conceal bad news in the peripheral financial statements away from reported earnings. I would submit that this is a distinctive advantage arising from the CARD's design in looking at comprehensive income over several years rather than reported earnings.

Although companies report differently under IFRS and USGAAP, the CARD was able to receive data from both systems, the only difficulty being that US financial reports have a different layout and sometimes disperse data across separate reports.

But the CARD's limitations did also emerge in the case study analysis:

- It is doubtful whether the CARD would have identified the emerging financial crises at Lloyds Bank and Royal Bank of Scotland. Even with micro-analytical study of the historic annual reports, an incorrect conclusion could have been drawn that the steady earnings, profits and dividends signalled safety. The only warning that would have come from the CARD analysis would have been the high level of gearing at +90% as was seen at all the UK banks. Perhaps the learning point here is that +90% gearing is dangerous no matter how stable the historic data trends.
- Segmental data was problematic for those case studies where the segments had been changed from year to year as was seen in Abcam. It was also problematic where the business was so complex that the CARD did not have enough fields in its structural design to accommodate a large number of segments as was seen in Berkshire Hathaway. Additionally, although not a limitation in the CARD design itself, some companies simply do not report meaningful segmental data presumably as a way of obfuscating analysis by competitors, as was seen in Coca-Cola. This probably explains why the publicly available databases reviewed in Chapter 4 did not capture segmental data.
- Following on from this, the CARD is really only a first step in understanding a business. To gain a deeper understanding, a micro-analytical approach (Strauss and

Corbin 1998) is needed in order to understand the intricacies of each business. This can then be supplemented with interactions with management, customers and online forum participants as occurred in most of the case studies.

- Finally in using the CARD a small number of formula errors were discovered in the analysis page, typically where I had updated the data input template but not the associated formulas in the analysis. Ongoing formula debugging and development will be needed to ensure the CARD's analytical integrity and continuous improvement.

## Chapter 6 – Conclusions

The research questions have been progressively addressed throughout the project write-up. While I have kept to the original research questions, it became apparent by the end of the research that I had initially given too little attention to risk. At the outset I had aimed for an asset allocation research project. But by the end I realised asset allocation inherently needs to give a great deal of thought to the many manifestations of risk. The concept of risk therefore featured strongly in the case studies, CARD ratios and the Monte Carlo tools even though it had not appeared in the research questions.

### Replies to the research questions

1. Through critical literature review and discussion with relevant practitioners determine what techniques are available to capital allocators when making capital allocation decisions with a view to describing a prioritised hierarchy of distinctive capital allocation criteria and/or filters.

Whether on or off market, there are significant risks in terms of poor returns on capital or even destruction of capital as seen in the Chapter 1 Trustnet data. Long term capital allocation success, important to long term businesses and institutional investors such as pension funds, is therefore a function of maintaining returns decade after decade while avoiding or at least minimising losses. In this way the financial algebra of compounding can be achieved.

The techniques currently available to those who allocate capital would appear to be subject to several limitations enumerated below which may help to explain why capital allocation is problematic as illustrated in the Chapter 1 Trustnet findings and some of the Chapter 5 case studies.

Firstly, Modern Portfolio Theory and particularly the Efficient Market Hypothesis have not sufficiently described market behaviour, as I have argued in the Chapter 2 literature review critical reflection. Because markets are not efficient in the short-term, pricing anomalies do occur (Woolley 2010) and can be exploited by the alert capital allocator. Therefore capital allocation tools built on Modern Portfolio Theory would appear flawed as seen in the case of LTCM. In any case the Efficient Market Hypothesis does not apply to off-market

opportunities such as those faced by business managers who transact through direct, and usually secret, negotiation.

Secondly, ratio analysis as reported in the publicly available databases gave undue weight to reported earnings, sometimes under modified accounting bases, and current year data. For example, the popular price-to-earnings ratio only considers the latest year's reported earnings per the income statement on the implicit assumption that the latest year's earnings are the best estimate of the future. Earnings as defined in the income statement can exclude a number of volatile components which should be taken into account including currency fluctuations, fair value adjustments and pension fund deficits all of which impact on the eventual value of a shareholder's investment. Segmental earnings were ignored in the publicly available databases.

Thirdly, the publicly available databases themselves suffered from limited analytical capability. It seemed the databases gave greater primacy to cosmetic attractiveness over analytical utility. For instance FAME's data exports to Excel used variable column lengths, empty columns, missing rows, occasionally inconsistent account classifications from year to year, and data older than ten years was over-written thereby making it unusable for the analysis envisaged here. For those capital allocators who recognise this risk and develop their own in-house databases, then I would draw upon my client experiences to argue that discipline and an appropriate organisational culture are needed to ensure database integrity. The CARD has addressed this through its use of inbuilt audit metrics to aid data input accuracy, and triangulation metrics to highlight potential creative accounting risk. These were absent from the publicly available databases reviewed in Chapter 4.

Therefore the CARD is distinctive in that it contains unique ratios, a longer period of back-dated data including segmental data, a wide degree of analytical freedom, and I now have direct access to the underlying data rather than just an overlaid query engine as was the case in all of the publicly available databases.

But it is not just about database tools. Graham (1976), Buffett (1977 – 2012) and Scholes (Smithson and Simkins 2009) recognised the limitations of purely computational approaches to decision making and pointed towards a synthesis of cognitive and intuitive processes in contrast to the purely quantitative approach of Markowitz (1952). Digging further into

experiential intuition, Burke and Miller (1999) and Dane and Pratt (2007) analysed the role intuition can play in augmenting rational data analysis. While on its own intuition can lead to false certitude, this danger can be minimised when combined with rational quantitative analysis. By synthesizing cognitive and intuitive analysis two dangers are avoided, albeit not eliminated: firstly the danger of relying wholly on rational data analysis to the exclusion of subjective insights; and secondly the danger of subjective certitude lacking factual basis.

Therefore in answering RESEARCH QUESTION 1 I would now use principles rather than exclusively pre-defined ratios for optimising whilst simultaneously preserving financial capital. A prioritised hierarchy of principles are shown under RESEARCH QUESTION 3 below.

2. Through critical data analysis determine which businesses in the corporate sector have been consistently good at capital allocation throughout both good times and periods of crisis and seek disconfirming data from businesses which have been poor at capital allocation with the aim of producing a list of case study candidates for further analysis.

This phrasing of RESEARCH QUESTION 2 potentially opens up the discussion into ethical considerations around different business sectors such as tobacco, alcohol, weaponry, climate change and so forth. Throughout this project I have focused on how the compounding formula can be optimised, with an open mind as to which sectors are ultimately chosen by the capital allocator. This is because ethical considerations can have counter-arguments around the individual's freedom of choice, a nation's need to defend itself, the population's need for heating and transportation and so forth. The concept of ethics is also subject to temporal change: at the time of writing the banking sector might be considered at least by some as less ethical than might have been the case prior to the Global Financial Crisis. This is not to rule out consideration of ethics, but it can be overlaid as a filter in the analysis if desired. Therefore capital allocation is only considered in this project with regard to the objective of realising the compounding formula  $P_n = P_0(1 + i)^n$  over time as discussed in Chapter 1.

The phrase 'consistently good at capital allocation throughout both good times and periods of crisis' has an inbuilt presumption that capital is allocated over long periods of time which include 'good times' and 'periods of crisis' of unknowable duration. Mandelbrot (1966), Graham (1976), Buffett (1977-2012), Taleb (2007) and even Chapter 4's practical application



of Monte Carlo all tell us that risk is too unpredictable to expect to be able to make consistently good capital allocation decisions over time. The capital losses of LTCM, Enron and the UK banks would appear to have resulted from a misunderstanding or disregard of the risks that can destroy capital. Even Berkshire Hathaway had a period of loss as shown in the Chapter 5 case studies albeit relegated to the Changes to Shareholders' Equity statement. Therefore "consistency" needs to be understood across a number of years rather than just the most recent year.

This research amplifies the observation I had made as a student that compounding can give outsized returns with the passage of time. It also illustrates a mathematical oversight in most analyst commentaries: that returns such as dividend yield are only based on the ever-changing current price not the historic price originally paid by a long-term holder. To illustrate that with a thought experiment we saw that Coca-Cola shares pay dividends of around USD\$1 per share each year. For Shareholder A who bought their shares at \$40 the dividend return amounts to 2.5%. Shareholder B who bought at \$60 would experience a less favourable annual dividend return of 1.7%. Now let's say the shares rose in price to \$100. Shareholder A's capital profit would be  $\frac{(100-40)}{40} = 150\%$  whereas Shareholder B's capital profit would be  $\frac{(100-60)}{60} = 67\%$ . On the other hand if Coca-Cola suffered a crisis and the shares dropped to \$50 then Shareholder A would still be in capital profit of  $\frac{(50-40)}{40} = 25\%$  but Shareholder B would suffer a capital loss of  $\frac{(50-60)}{60} = -17\%$ . In each scenario Shareholder A, who paid less for the shares in the first instance, experiences a more favourable outcome. Shares in the *same company* but purchased at *different initial prices* can produce very different returns. The importance of not overpaying for an asset will be carried into the insights sought by RESEARCH QUESTION 3.

Multiple year case studies were identified and analysed in Chapter 5. In order for this project to have value, this kind of case study research using the CARD needs to be continued by my firm over the coming years through continuing to engage with the capital allocation community, and in using the tools to build up the firm's intellectual property to guide decision-making.

3. Using those case studies, analyse relevant historic and recent data in order to delineate incremental insights into capital allocation approaches and capture this in a way that can be used as an ongoing basis for learning.

Here at the end of the project it is clear the learning has only just started. The dimensions of capital allocation are broad as shown in the Figure 2 mind-map. On a daily basis markets reveal new information about corporate activity, they generate price data, companies release interim and annual reports and the media report fresh stories relevant to the capital allocator. The CARD helps to capture some of that data as a first step in ongoing learning.

As to the incremental insights into capital allocation, those which are key from this project's research, including the intuitive insights gained from the literature (Graham 1976, Buffett 1977 – 2012, Burke and Miller 1999, Dane and Pratt 2007), have been incorporated into my firm's Capital Allocation Policy as follows:

- **Analytical integrity.** The problem with research bias, several forms of which were recognised in Chapter 1, is that it can distort conclusions arising from analysis and therefore impact negatively upon decision-making (Flyvbjerg 2003). The discovery of the rating agency model flaws illustrated another kind of analytical error stemming from poor model design, compounded by an organisational resistance to correcting the errors once they were found. Chapter 5's case studies revealed a further epistemic risk arising from management optimism, or sometimes deception, in presenting falsely favourable accounting data. It is hoped the CARD's design addresses these epistemic risks through sourcing its data directly from audited financial statements, rather than a derivative source such as the publicly available databases; through audit metrics designed to detect data input errors; and through unique triangulation metrics designed to compare time-series accounting data with time-series cash flows and management's qualitative assertions. This should help in making Kelly Partners' analysis less prone to error than might be the case with other market participants.
- **Certainty of value.** As pointed out under epistemic risks in Chapter 1, the certainty of an asset's future value is never assured. The aim is to buy an asset today which has the potential to achieve a greater value in the future exceeding the cost of

capital. To achieve optimum certainty requires the purchase of an asset which is well understood by the capital allocator (Buffett's "circle of competence" (Buffett 1996)); has a long history of value increment hence the importance of multi-year analysis; and is purchased at such a low price that the greater likelihood is that future capital value will be enhanced rather than diminished. Inherent within this is the avoidance of ethical risks which could encompass damage to society, moral hazard (Roubini and Mihm 2011), and management agency abuses (Jensen and Meckling 1976).

- **Thrift when allocating financial capital.** As seen in the thought experiment in answer to RESEARCH QUESTION 2, paying the lowest possible price for an asset, by negotiation or by taking advantage of market fluctuation, the capital allocator achieves simultaneously three objectives: firstly, any future returns (or losses) will be mathematically more favourable than if a higher price had been paid at the outset; secondly the risk of further value reduction is less than if a higher purchase price had been paid; and thirdly any dividends received will be at a higher rate of return due to the lower cost denominator. In agreeing the initial purchase the capital allocator needs to factor the risk of potential loss into the agreed purchase price. Depending on the extent to which debt has been used, the mathematical probability should be in the capital allocator's favour as the maximum loss is the purchase price whereas the maximum gain is unlimited.
- **Avoidance of the risk of over-paying.** This can happen for instance during market bubbles (Roubini and Mihm 2011), in a bidding war as we saw in the Royal Bank of Scotland case study, or when the capital allocator fails to negotiate a price which appropriately reflects the asset's value. In this case the advantages described in the previous paragraph transmogrify into disadvantages because the likelihood is greater that the asset will decline in value rather than increase in value over time. If debt has also been used, the consequences can be disastrous as we saw in LTCM and the UK bank case studies.
- **Avoidance of debt.** As shown both in the Chapter 2 literature review (especially Miller 1988, Lowenstein 2001) and Chapter 5 case studies (Aero Inventory, UK banks), enhancing returns through maximum leverage has been a frequently pursued strategy. While the mathematics of leverage appear to support maximising

debt, the contractual practicalities of debt mean that the frequency of repayments may not correspond with cash flows from the underlying asset resulting in the risk of default which can in turn trigger immediate closure of the business. Capital allocation safety can therefore be increased by not using leverage, or at least keeping its use to a minimum as was seen in the Sage and Livingwood case studies.

4. From the above research into relevant literature and case studies, describe how the findings can be used to develop a new model which can be used to improve capital allocation decision-making and translate this into a knowledge based tool or suite of tools for use by my firm in providing value-adding client services .

The problem the capital allocator has to grapple with is that decisions need to be made *today* based on uncertain expectations about the *future* which are derived from flawed accounting data produced in the *past*. Any model therefore needs to include (a) reliable historic data and (b) a way of dealing with future risks about which we have only experiential judgement rather than objective data.

The DuPont system of accounting ratio analysis (Brealey *et al* 2006, Soliman 2008) which came to light in Chapter 2's literature review has been expanded in Chapter 4's tool construction to include audit metrics aimed at exposing business risks and creative accounting anomalies harmful to capital allocation decision-making. Examples were seen in the case studies where the CARD helped in penetrating unusual accounting practices at Aviva, Berkshire Hathaway, Lloyds Bank and Woolworths.

Longer time series analysis has been achieved in the CARD than was seen in the publicly available databases in order to better understand business performance through periods of economic cycles and changes in management.

Therefore this project has achieved the production of a new customised research database, the CARD, designed around the trans-disciplinary principles emerging from the synthesis of the literature review and my past experiences chiefly as a chartered accountant and auditor. The use of a database for this kind of analysis is not new. But much as McDonalds did not invent the hamburger, the CARD's special sauce is in its data integrity design, analytical metrics designed to penetrate creative accounting techniques and in its use of elongated

time series data to look across economic cycles and management changes. In these ways the CARD is not merely a theoretical tool to support this project, but is of ongoing utility to my firm. An example of the CARD's data input template is shown as Appendix 3; and the CARD's analytical metrics as Appendix 4.

Because of the importance of analysing across as many years as practical, the CARD will grow in value over time as more data is added year-by-year. Historic data is not overwritten as was the case in most of the databases reviewed in Chapter 4. This means the research initiated by this project will gain relevance with marginal continued effort over the passage of time. Although time-consuming to create, the CARD is already proving efficient to maintain.

But the CARD does not eliminate the risk of poor capital allocation decisions. The CARD's quantitative analysis is further supported with experiential intuitive unstructured inquiries in such areas as the likelihood of future returns, debt structuring risks, management orientation, possible use of creative accounting and so forth. Monte Carlo is used for estimating probable future outcome distributions and in optimising portfolio weighting. To further reduce the risk of incorrect decisions, a capital allocation policy is shown under RESEARCH QUESTION 3 drawing from both the literature review (mainly Hertz 1964, Modigliani and Miller 1958, Buffett 1977 – 2012, Stiglitz 2010) and my own experiences. At each step in the analysis the practitioner has the opportunity to reflect on the data gathered and to formulate questions needed to answer the knowledge gaps arising. These questions can be addressed through research and/or through seeking meetings with knowledgeable management.

The Chapter 5 case studies illustrate the kind of synthesized quantitative/qualitative output generated by the model in the hands of the reflective, experienced practitioner.

<p>5. Disseminate a relevant subset of the knowledge gained to the firm's partners and professional associates and into the professional community in order to generate further debate and refinement of capital allocation practices.</p>
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The practical usage of Monte Carlo has been particularly well received among the practitioner community as evidenced by the publication of my articles in UK and US

practitioner magazines and other inquiries as evidenced in Appendix 7 and Appendix 8. While the tools are at a practical stage of utility, further ongoing refinement is expected to occur with continuing usage.

The final version of this project will be disseminated to the firm's partners and associates and I understand it will also be available through the Middlesex University Institute for Work Based Learning.

Of the three articles published during this project (Kelly 2010, Kelly and Alexander 2011 and Kelly 2012), the first resulted in our appointment to the Australian railway client to carry out Monte Carlo risk analysis. The results were then shared with the company's Chinese parent and two other Australian rail sector companies John Holland Ltd and United Group Rail Ltd resulting in numerous discussions and debates mostly related to the input estimations.

By the end of the research I came to the view that the research, the CARD and Monte Carlo analysis tools were a work in progress and only the start of a capital allocation project that will probably consume the remainder of my working life of at least two more decades (God willing) during which the firm's learnings, experience, network of contacts and disseminations will hopefully expand.

### **Areas for further research**

This subject lends itself to further research. I would suggest the following are the most relevant areas where I hope to be involved, or hope to read of other's results, in ongoing research:

- The CARD is a dynamic database which will require ongoing data population, design enhancement and research by my firm. Further development of the research tools arising from this doctorate lend themselves to a collaborative research methodology around efficient data acquisition, further analytical development, and in seeking more interactions with management to triangulate what is reported in the annual reports to ever-changing business conditions. In this way Kelly Partners could find itself at the centre of continuing research in testing and refining capital allocation tools.
- Further research into emerging creative accounting techniques.

- If financial intermediaries effectively obfuscate good financial allocation through self-interest and short-termism (Woolley 2010) then more work needs to be done to understand that problem, disseminate it and solve it for the future as it has significant social implications for everyone with an interest in how capital is allocated on their behalf.
- Although risk occurs at organisational level, macroeconomic factors are also at play, including foreign currency fluctuations and actions by regulators. Soros is known to place particular reliance upon macroeconomic factors in allocating capital (Soros 1994, Umpleby 2007). Further research into the interplay of macroeconomic factors in capital allocation decision-making is warranted.
- The importance of financial capital allocation amongst the general population is poor despite its importance to investors, employees and pensioners. It was neither taught when I was at school nor as part of my undergraduate degree.

## Chapter 7 – Critical reflections on self, business and society

### Impact of this project on myself

Prior to this project I was reliant on journalistic commentary in the financial press for my knowledge of what was happening in the economy and amongst the major companies and banks. Having done this project I am now more critical and reflexive about what I read and hear in the financial press. The CARD enables me to more critically engage with my online learning set and with client management.

My experience with Microsoft Excel and its predecessors Supercalc and Lotus 123, arising from near daily usage since I started work at Ernst & Whinney in 1987, proved beneficial with regard to designing and building the CARD and the Monte Carlo risk model. Without realising it, and at no marginal cost, several disparate employers over a period of two decades have provided me with valuable real-world education of significant value to this project. I am now aware that those workplace skills have been transferable to research which will take my firm into a new area of activity.

At least the effort to create the CARD and Monte Carlo tools for this research will be to my firm's long term benefit as we now own the intellectual property formatted in a way which meets the firm's specific objectives as a consultancy practice. It is intellectual property which will grow in value as it is kept up to date with usage, adaptation and new data in the coming years.

The use of Monte Carlo as a capital allocation aid has been a surprising discovery. Being an advanced mathematical simulation tool it was understandably not mentioned during my undergraduate studies. On the two occasions I encountered it in professional practice over the past decade it was presented as a highly technical tool requiring specialised knowledge and software. My experiments with Monte Carlo during this research and consultation on the underlying mathematics with Dr David Alexander proved beneficial in supplementing the analytical toolkit. David and I subsequently collaborated on an article on Monte Carlo which was published in *Accountancy* (Kelly and Alexander 2011). That discovery would not have happened had I not undertaken this doctorate and had I not had an open mind as to where the research might lead.



## Impact of this project on my firm

As well as developing my own critical reflexivity I have been able to share this with the people I work with. It has widened my thinking into all areas of commerciality, which in turn has multiplied the number of discussions I have with superiors, peers and subordinates and which has in turn increased my network of contacts as shown by my [www.linkedin.com](http://www.linkedin.com) profile. The email from my rail client's Chinese parent company included in Appendix 8 evidences the increasing interest in my use of Monte Carlo for risk analysis.

Specifically, as will be evident from the project write-up a number of clients were serviced while this project was being undertaken, most of which assisted in the development of my ideas around relevant topics, such as risk. But it went both ways. Because my mind was engaged on the trans-disciplinary subject of capital allocation, that manifested itself in the work I was asked to do by clients. For instance the Australian rail client had initially asked me to set up an internal audit function in a six week period. But during that time it quickly became apparent there was more value to add in risk management. So the assignment was extended to encompass risk management which in turn allowed me to put into practice and thereby further develop my ideas on Monte Carlo. This became a major focus of discussion at board level which continues at the time of writing.

Furthermore the rail client also asked me to take on responsibility for insurance and corporate treasury. This was an unusual development, unheard of among my internal audit peers. To avoid a breach of the Institute of Internal Auditors' professional standards on auditor independence, the client ensured I did not have bank mandate authority. Setting up a research group consisting of the Australian treasury manager, the local ANZ bank manager and his team of product specialists, the AON insurance broker and a professional colleague from the UK I was able to lead the implementation of a number of measures to reduce risk through better cash flow management, foreign exchange hedging, fragmentation of term deposits to reduce liquidity risk, increased interest income earnings on pooled cash, cost savings arising from a change in insurance broker, and improved total insurance coverage all of which exceeded AUD\$1 million in annual recurring cost savings.

Emboldened by the mathematical insights gained during the Chapter 2 literature review and Chapter 4 Monte Carlo experiments, I engaged the services of a consultant actuary in

another research project to challenge the rail company's biggest insurer on a 10% increase in the company's annual insurance premium. This resulted in a further one-off AUD\$1 million saving on the insurance cost.

A further AUD\$4 million was saved in our routine internal audit programme arising from process and human resource efficiencies, supply chain cost savings, recovery of duplicate payments, and fraud elimination through combining the principles of reflective and collaborative research. Taken together, I was able to make a tangible and noticeable improvement to my client's allocation of capital across a number of areas and to act as witness in the company's defence in two court cases. To reinforce that point, the railway's Chief Financial Officer has set Kelly Partners a target of AUD\$10 million in cost savings for 2012/13 (Appendix 9).

### **Impact of this project on society**

The research in this project and its application to my client services has helped to systematise my approach to achieving organisational change at Kelly Partners. As well as delighting clients with various cost savings and gaining repeated contract extensions, another British consulting firm noticed my results and we agreed a strategic alliance under which they are now marketing the services of Kelly Partners as part of their own offering to clients.

Therefore related to the expansion of my own thinking around making better use of capital, my firm is now experiencing a larger and more positive impact on the commercial world in which we provide our services. So I am having an impact on at least a small number of organisations within society at large through deeper thinking within my field, and finding ways to interact with, and persuade, management to do things differently and in ways that benefit their own capital allocation decisions.

Returning to Chapter 1 Figure 1, the UK investment trust sector has on average failed to provide society with returns that met market indices or inflation, a failing Malkiel (2006) had observed four decades ago. This project has sought to develop ways to improve the integrity of capital allocation decision-making.

In effecting a capital allocation strategy at Kelly Partners, a stock broking account was set up with Talos Securities Ltd regulated by the Financial Services Authority, and HM Revenue and Customs were informed of the firm's change of business focus to include capital investment as well as consulting services. If we can go on to establish a record in capital allocation that produces returns greater than the average performance seen in Figure 1 then Kelly Partners will offer its services to the public as a hedge fund whose strategies are founded upon the principles shown in the reply to RESEARCH QUESTION 3.

The above discussion exposes an unforeseen vulnerability: If Kelly Partners has used the insights gained from the doctorate to enhance its client services as well as its capital allocation capabilities, is a demarcation between those two services needed? The issue here is that the risks of each service type are different. Client services are vulnerable to professional indemnity claims, whereas capital allocation services are vulnerable to macroeconomic vicissitudes. By seeking to provide both services, Kelly Partners will, if successful, increase its risk of litigation as it could be seen as a firm with so-called deep pockets. Therefore the client services will need to be legally segregated from the capital allocation services.

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## Appendix 2 – Author’s publications

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Kelly, C 2002, 'Making the most of business risk metrics part 2', *Internal Auditing & Business Risk*, July 2002, pp. 30-31.

Kelly, C 1999, 'Palmtop productivity', *Internal Auditing & Business Risk*, September 1999, pp. 22-24.

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## Appendix 3 – CARD data input template example

Selling & admin	0			553	613	760														
Research & development	0																			
Impairments	0				269															
Director remuneration	0																			
Staff costs	0																			
Depreciation & amortisation	0				63	16	61	83	111	477	715	572	679	829	911	982				
Exceptionals	0																			
Minorities	0																			
Other expenses	2,610	2,610	2,570	-9	-62	0	0	0	0	0	0	0	-1	-1	-1	-1				
Reported EBIT attrib to ord	440	440	407	292	175	320	3,706	2,827	4,314	2,450	5,587	1,469	6,359	12,020	10,936	12,791				
Interest & other inv income	0			955	548	823														
Interest paid	0			57	60	59														
Tax on everything	0			492	159	276	1,197	898	1,457	852	2,018	620	2,134	3,805	3,569	4,159				
Minorities	0			10	9	13	20	28	27	41	241	54	15	64	59	104				
Profit after tax attrib to ord	440	440	407	688	495	795	2,489	1,902	2,830	1,557	3,328	795	4,286	8,151	7,308	8,528				
PAT audit check	440	440	407	688	495	795	2,489	1,901	2,830	1,557	3,328	795	4,210	8,151	7,308	8,528				
Foreign currency loss/(gain)	0											108	90	-217	-140	-274				
Fair value loss/(gain)	0											-428	4,539	-1,413	-5,147	-640				
Pension loss/(gain)	0											23	250	2	35	24				
Minorities	0																			
Other loss/(gain)	0	0	0	0	0	-13	-21	-28	0	0	0	0	0	0	0	0				
Reported comprehensive ir	440	440	407	688	495	808	2,509	1,930	2,830	1,557	3,648	-3,857	5,666	13,436	8,187	5,453				
<b>BALANCE SHEET</b>																				
Properties	0																			
Plant & equipment	0				275	333	1,034	1,057	1,509	1,903	2,699	4,776	5,407	6,260	6,516	7,500				
Long term investments	14,462	14,462	17,132	19,521	19,783	25,572	35,782	48,635	80,585	97,995	95,916	115,829	112,886	86,285	87,668	82,704				
Long term tax assets	0																			
Intangibles	0						3,110	3,067	18,570	18,281	18,875	21,510	22,298	22,948	23,012	23,644				
Other fixed assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Total fixed assets	14,462	14,462	17,132	19,521	20,058	25,905	39,927	52,758	100,664	118,179	117,490	142,115	140,591	115,493	117,196	113,848				
Trade debtors	0				581	719	1,523	1,712	7,224	8,558	11,764	11,926	13,175	16,833	15,525	23,484				
Other debtors & prepayme	0													8,620	8,884	12,190				
Inventory	0				425	601	620	639	767	844	1,275	2,213	3,030	3,656	3,842	4,143				
Cash	0				274	2,704	1,340	1,002	13,582	3,835	5,263	6,498	12,748	35,957	43,427	44,660				
Short term tax assets	0																			
Short term investments	0																			
Other current assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Total current assets	0				1,280	4,024	3,483	3,353	21,573	13,237	18,302	20,637	28,953	65,066	71,678	84,477				
Total assets	14,462	14,462	17,132	19,521	21,338	29,929	43,409	56,111	122,237	131,416	135,792	162,752	169,544	180,559	188,874	198,325				
Total assets audit check	14,462	14,462	17,132	19,521	21,338	29,929	43,409	56,111	122,237	131,416	135,792	162,752	169,544	180,559	188,874	198,325				
Trade creditors	0				397	482	2,557	2,202	7,182	7,458	8,374	9,626	11,913	12,316	12,294	13,050				
Unpaid dividend	0																			
Tax creditors	0																			
Short term financing	0						1,184	1,274	3,324	3,718	3,885	9,617	13,968	3,650	4,454	5,061				
Short term provisions	0																			
Other current liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Total current liabilities	0				397	482	3,740	3,476	10,506	11,176	12,259	19,243	25,881	15,966	16,748	18,111				
Long term trade creditors	0																			
Long term financing	1,101	1,101	1,155	972	5,574	6,377	9,070	10,184	40,922	51,490	50,415	77,189	70,184	75,258	73,221	75,662				
Deferred tax & long term te	0				3,293	5,589	6,838	10,539	11,762	9,566	10,125	7,021	8,051	10,994	12,247	12,252				
Long term provisions	0																			
Other long term liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Total long term liabilities	1,101	1,101	1,155	972	8,867	11,965	15,908	20,723	52,684	61,056	60,540	84,210	78,235	86,252	85,468	87,914				
Total liabilities	1,101	1,101	1,155	972	9,264	12,447	19,648	24,199	63,190	72,232	72,799	103,453	104,116	102,218	102,216	106,025				
Total liabilities audit check	1,101	1,101	1,155	972	9,264	12,447	19,648	24,199	63,190	72,232	72,799	103,453	104,116	102,218	102,216	106,025				
Balance sheet is out of bal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Shares in issue at y/e	1	1.146	1.149	1.178	1.178	1.187	1.232	1.234	1.519	1.521	1.526	1.528	1.535	1.535	1.538	1.540				
Exec director shares	0														0.547	0.553				
Closing share price at y/e	9,050	9,050.00	11,750.00	16,325.00	20,400.00	32,100.00	34,100.00	46,000.00	70,000.00	56,100.00	71,000.00	75,600.00	72,750.00	84,250.00	87,900.00	88,620.00				
<b>CASH FLOWS</b>																				
EBITDA	0				1,186	1,164	1,482	2,718	1,038	4,434	4,592	7,023	10,842	7,933	6,545	7,844				
(Increase)/decrease in wor	0								-52	-839	-2,402	-120	166							
CASH FLOW FROM OPE	0	0	0	0	1,186	1,164	1,482	2,718	986	3,595	2,190	6,903	11,008	7,933	6,545	7,844				
(Tax paid)	0				-257	-36	-222	-383	-329	-1,395	757	-329	195	505	860	1,602				
NET CASH FLOW AFTER	0	0	0	0	929	1,128	1,260	2,336	657	2,200	2,947	6,574	11,203	8,438	7,405	9,446				
(Investment)/disinvestment	0				-2,149	1,214	-3,508	-2,531	12,713	-12,598	-2,271	-11,694	-1,379	15,932	221	-13,841				
FREE CASH FLOW AFTE	0	0	0	0	-1,220	2,342	-2,248	-196	13,370	-10,398	676	-5,120	9,824	24,370	7,626	-4,395				
Financing: equity & loans r	0				-345	113	854	-96	61	367	470	6,014	-3,574	-1,161	-156	5,628				
Financing: (interest receive	0																			
Financing: (interest paid)	0																			
Financing: (dividends paid)	0																			
Financing: (increase)/decre	0				1,565	-2,455	1,394	292	-13,431	10,031	-1,146	-894	-6,250	-23,209	-7,470	-1,233				
Financing: total	0	0	0	0	1,220	-2,342	2,248	196	-13,370	10,398	-676	5,120	-9,824	-24,370	-7,626	4,395				
Cash flow is out of balance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

## Appendix 4 – CARD data output metrics example

Company	LLOY	LLOY	LLOY	RBS	RBS	RBS	TSCO	TSCO	TSCO	SBRY	SBRY	SBRY
Year	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
Year end	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	31-Dec	28-Feb	28-Feb	28-Feb	31-Mar	31-Mar	31-Mar
Asset strength	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m
Share price	£0.51	£0.66	£0.32	£0.29	£0.39	£0.24	£3.60	£4.35	£3.90	£3.30	£3.30	£3.51
NAV per share	£0.69	£0.69	£0.68	£0.88	£0.70	£0.69	£1.63	£1.84	£2.07	£2.48	£2.65	£2.92
NTAV per share	£0.49	£0.50	£0.51	£0.72	£0.57	£0.56	£1.12	£1.32	£1.53	£2.39	£2.58	£2.83
Price to NAV book ratio	73.3%	95.4%	47.2%	32.9%	55.6%	34.8%	220.2%	236.6%	188.8%	133.0%	124.3%	120.4%
Cum equity per share growth	-11.9%	-10.8%	-10.0%	-47.7%	-43.1%	-37.7%	10.8%	11.3%	11.6%	-0.4%	1.0%	2.4%
Market capitalisation	£32,334	£44,725	£21,993	£31,136	£42,765	£26,455	£28,423	£34,735	£31,381	£5,819	£6,174	£6,529
<b>Business returns</b>												
Comprehensive inc before int & tax	£1,042	£502	£-1,372	£-16,176	£36	£447	£3,156	£3,933	£4,243	£666	£842	£1,008
Average capital employed	£731,644	£1,009,415	£981,060	£2,049,069	£1,575,031	£1,480,222	£37,864	£45,794	£46,615	£10,074	£10,444	£11,127
Average equity employed	£26,903	£45,505	£46,748	£87,565	£85,741	£76,452	£12,404	£13,794	£15,652	£4,656	£4,671	£5,195
ROavCE (based on comprehensive)	0.1%	0.0%	-0.1%	-0.3%	0.0%	0.0%	8.3%	8.6%	9.1%	6.6%	8.1%	9.1%
ROavE (based on comprehensive)	3.9%	1.1%	-2.9%	-7.1%	0.0%	0.6%	25.4%	28.5%	27.1%	14.3%	18.0%	19.4%
PE (based on comprehensive incor)	10.9	-1208.8	-40.4	-5.4	-71.5	-35.0	15.9	15.4	11.4	20.1	12.0	9.7
PSR (market cap/total sales)	0.5	0.7	0.5	0.6	1.0	0.7	0.5	0.6	0.5	0.3	0.3	0.3
<b>Shareholder returns</b>												
Comprehensive EPS based on CIP	£0.05	£0.00	£-0.01	£-0.05	£-0.01	£-0.01	£0.23	£0.28	£0.34	£0.16	£0.27	£0.36
Dividend per share DPS	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.11	£0.12	£0.13	£0.12	£0.13	£0.14
Dividend yield %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	2.8%	3.4%	3.7%	3.9%	4.1%
DPS growth on prior year	-100%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	11%	8%	11%	23%	4%	12%
Dividend cover (times)							2.0	2.3	2.5	1.3	2.1	2.5
NAV at beginning of year	£1.68	£0.69	£0.69	£2.04	£0.88	£0.70	£1.51	£1.63	£1.84	£2.79	£2.48	£2.65
PLUS increase in NAV per share	£-0.99	£0.00	£-0.01	£-1.16	£-0.18	£-0.01	£0.12	£0.20	£0.23	£-0.31	£0.17	£0.26
PLUS dividend per share	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.11	£0.12	£0.13	£0.12	£0.13	£0.14
Total shareholder return	£-0.99	£0.00	£-0.01	£-1.16	£-0.18	£-0.01	£0.24	£0.33	£0.36	£-0.19	£0.30	£0.41
Shareholder return as % of op NAV	-58.8%	-0.4%	-1.6%	-56.8%	-20.3%	-1.7%	15.6%	19.9%	19.7%	-6.7%	12.1%	15.3%
Net no. shares issued/(purchased)	57,993.5	4,299.5	652.6	67,909.7	2,092.4	770.3	14.3	89.7	61.4	-4.0	107.8	-11.0
<b>Risks</b>												
Y/E equity employed excl pref sha	£44,107	£46,902	£46,594	£94,631	£76,851	£76,053	£12,906	£14,681	£16,623	£4,376	£4,966	£5,424
Y/E debt employed incl pref shares	£983,148	£943,140	£920,786	£1,596,081	£1,372,295	£1,426,630	£21,613	£19,054	£17,040	£2,395	£2,473	£2,472
Y/E capital employed	£1,027,255	£990,042	£967,380	£1,690,712	£1,449,146	£1,502,683	£34,519	£33,735	£33,663	£6,771	£7,439	£7,986
Debt ratio (debt/CE)	95.7%	95.3%	95.2%	94.4%	94.7%	94.9%	62.6%	56.5%	50.6%	35.4%	33.2%	31.3%
Net debt ratio (debt-cash)/CE	91.9%	91.4%	88.9%	91.3%	90.8%	89.7%	52.4%	48.1%	45.1%	26.1%	22.0%	25.0%
Interest cover ratio (times)	-0.1	-1.1	0.1	-0.2	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Dividend cover ratio (times)							2.0	2.3	2.5	1.3	2.1	2.5
Net current assets	£16,859.00	£19,407.00	£20,903.00	£53,311.00	£41,775.00	£47,688.00	£-4,514.00	£-4,623.00	£-5,862.00	£-1,349.00	£-940.00	£-1,221.00
Net assets	£44,107.00	£46,902.00	£46,594.00	£94,631.00	£76,851.00	£76,053.00	£12,906.00	£14,681.00	£16,623.00	£4,376.00	£4,966.00	£5,424.00
Taffler-Tisshaw z-score	0.1	0.1	0.1	0.1	0.1	0.1	2.0	2.3	2.4	2.9	3.0	3.1
<b>Working capital efficiency</b>												
Debtor days	60 days	82 days	130 days	14,519 days	12,387 days	12,569 days	11 days	12 days	13 days	4 days	4 days	5 days
Inventory turnover using COGS	0 days	0 days	0 days	0 days	0 days	0 days	22 days	22 days	19 days	17 days	16 days	16 days
Payables turnover using COGS	0 days	0 days	0 days	0 days	0 days	0 days	69 days	75 days	65 days	58 days	55 days	53 days
<b>Treasury efficiency</b>												
Av interest received on liquids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.5%	0.3%	0.9%	0.6%	0.6%
Av interest paid on debt (incl pref s	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	3.0%	2.8%	6.2%	6.0%	4.7%
Tax expense	£-1,911	£539	£-828	£-429	£634	£1,203	£779	£840	£864	£177	£148	£187
Tax cash (outflow)/inflow	£301	£332	£-136	£-719	£565	£-184	£-456	£-512	£-760	£-160	£-89	£-158
Av tax expense rate	-183.4%	107.4%	60.3%	6.9%	1761.1%	269.1%	30.4%	27.2%	23.9%	38.0%	22.4%	21.7%
<b>Management orientation</b>												
No. exec directors	5	5	2	5	5	3	8	8	8	5	4	5
Director ownership %	0.01%	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.14%	0.14%	0.00%	0.17%	0.19%
Incr/(decr) in director shares	407,34%	4.67%	-61.69%	7.86%	53.03%	52.09%			0.00%			13.99%
Sales per exec director	£13,205	£12,389	£20,911	£9,748	£8,529	£13,043	£6,751	£7,118	£7,624	£3,771	£5,032	£4,254
Comprehensive earnings per exec	£591	£-27	£-272	£-1,149	£-120	£223	£281	£343	£58	£128	£128	£135
Av salary per director (scaled)	£1,633	£1,919	£2,104	£0,712	£1,310	£2,105	£3,000	£3,438	£2,936	£0,938	£1,627	£1,298
Av salary per employee	£0.051	£0.044	£0.051	£0.060	£0.063	£0.060	£0.016	£0.017	£0.018	£0.021	£0.021	£0.021
<b>Segmental results</b>												
Segment 1 sales %	42.8%	47.4%	62.9%	54.0%	53.4%	54.7%	100.0%	100.0%	66.7%	100.0%	100.0%	100.0%
Segment 2 sales %	6.4%	7.1%	11.8%	17.9%	19.2%	16.3%	0.0%	0.0%	15.0%	0.0%	0.0%	0.0%
Segment 3 sales %	28.9%	25.4%	-0.9%	7.7%	10.6%	6.9%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%
Segment 4 sales %	13.5%	13.2%	19.5%	10.8%	12.0%	10.9%	0.0%	0.0%	16.0%	0.0%	0.0%	0.0%
Segment 5 sales %	8.3%	7.0%	6.6%	9.6%	4.8%	11.2%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%
Aggregate sales growth %	276.0%	-6.2%	-32.5%	-17.5%	-12.5%	-8.2%	14.0%	5.4%	7.1%	5.6%	6.7%	5.7%
Segment 1 sales growth %	60.7%	3.9%	-10.3%	-46.9%	-13.4%	-6.0%	14.0%	5.4%	-28.6%	5.6%	6.7%	5.7%
Segment 2 sales growth %	31.7%	3.8%	11.8%	-11.1%	-6.2%	-22.1%						
Segment 3 sales growth %	-307.9%	-17.7%	-102.3%	-144.4%	20.1%	-40.2%						
Segment 4 sales growth %	65.3%	-8.9%	0.3%	-16.8%	-2.6%	-17.0%						
Segment 5 sales growth %	932.0%	-21.4%	-35.9%	145.6%	-56.4%	115.4%						
Aggregate gross margin %	34.1%	39.6%	49.7%	58.8%								
Segment 1 gross margin %	32.0%	42.8%	48.3%	50.9%	62.4%	59.2%	22.2%	23.0%	-37.4%	20.2%	18.9%	18.5%
Segment 2 gross margin %	64.3%	61.9%	71.8%	68.1%	73.0%	77.1%			100.0%			
Segment 3 gross margin %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%			100.0%			
Segment 4 gross margin %	-146.1%	-127.2%	26.1%	17.3%	6.7%	30.3%			100.0%			
Segment 5 gross margin %	86.3%	89.5%	100.0%	100.0%	100.0%	100.0%			100.0%			
<b>Data integrity checks</b>												
Net profit before tax	£4,864	£-576	£284	£-5,318	£-1,232	£-1,959	£1,004	£1,409	£1,882	£112	£365	£486
Expected tax at 30%	£1,459	£-173	£85	£-1,595	£-370	£-588	£301	£423	£565	£34	£110	£146
Accounting tax expense	£-1,911	£539	£-828	£-429	£634	£1,203	£779	£840	£864	£177	£148	£187
Cash tax (outflow)/inflow	£301	£332	£-136	£-719	£565	£-184	£-456	£-512	£-760	£-160	£-89	£-158
EBIT	£1,042	£281	£-3,542	£-2,647	£-399	£-766	£2,924	£3,403	£3,868	£562	£848	£911
Add back non-cash expenses	£19,473	£13,384	£10,269	£16,428	£11,416	£10,675	£1,167	£1,358	£1,446	£468	£479	£482
Expected cash inflow from operatio	£20,515	£13,665	£6,727	£13,781	£11,017	£9,909	£4,091	£4,761	£5,313	£1,030	£1,327	£1,393
Actual cash inflow from operations	£9,739	£11,933	£-3,542	£7,099	£11,713	£6,953	£5,137	£5,982	£5,428	£1,114	£1,114	£1,216
Interest received per cash flow	£0	£0	£0	£0	£0	£0	£0	£81	£128	£0	£20	£20
Interest received per P&L	£0	£0	£0	£0	£0	£0	£116	£265	£150	£52	£33	£32
Interest paid per cash flow	£-2,738	£-1,989	£-2,176	£-1,746	£-639	£-714	£-565	£-692	£-616	£-131	£-111	£-126
Interest paid per P&L	£0	£0	£0	£0	£0	£0	£478	£579	£483	£148	£148	£116
Average deprec/amort rate	22.8%	13.4%	13.6%	8.5%	9.1%	8.9%	5.4%	5.6%	5.5%	7.5%	6.5%	5.6%
Net assets should be same as ...	£44,107	£46,902	£46,594	£94,631	£76							

## Appendix 5 – Errors noted in FAME database

The following errors were drawn to FAME’s attention in email correspondence with Russell Dixon, IT Support Consultant of Bureau van Dijk dated 4 and 5 Oct 2012.

**FAME - Amlin**

- Awkward column structure
- Missing rows
- Classification inconsistencies
- Long term investments classified as short term debtors

**FAME - BHP**

- Net cash figures are consistent with audited financial statements.
- FAME shows zero dividends & tax but actual tax paid was £3bn per annum per audited financial statements.
- Net cash movements do not match audited financial statements.

Financial statements one year out of date.

## Appendix 6 – Some differences between UK and US accounting

Annual financial statements typically run to several hundred pages of data and explanatory notes and are drawn up under the relevant generally accepted accounting principles of the company's home country applicable at the time the accounts were created. Generally accepted accounting principles are themselves subject to change from year to year which means even when faithfully replicated in the CARD, the annual results may not be strictly comparable if there have been fundamental changes to the underlying accounting rules.

As the Chapter 5 case studies included both UK and US companies, the following summarises how US accounts over the past decade have differed from UK accounts, and the mitigating actions I devised to aid comparability.

US accounts are submitted on Form 10K or Form 20F under the US 1934 Securities Exchange Act and follow US generally accepted accounting principles (USGAAP). For the period analysed the US has not adopted International Financial Reporting Standards. US income statements, balance sheets and cash flow statements follow approximately the same format as the UK with the following key areas of difference:

- The most obvious difference is that US accounts are presented in US dollars and UK accounts in either UK pounds sterling or, less frequently, Euros or US dollars. As exchange rates can vary significantly over a number of years I have not made any adjustments for currency other than to ensure the relevant currency is clearly disclosed.
- Under US disclosure practices, income statements and cash flow statements usually provide the current year plus two prior years whereas only the current year and prior year are shown in UK accounts.
- US accounting makes greater use of “other assets”, “other liabilities”, “other expenses” and so forth without further explanation. Judgement has to be used to determine what such categories may represent, usually by a process of eliminating the remaining asset or liability categories and using the management commentary to reflect upon the nature of the business under review.
- US income statements and related notes do not disclose the same level of detail regarding expenditure items, such as depreciation expense, amortisation expense,

employee remuneration, research and development costs and so forth. Instead these are included under Selling and Administration Expenses or a similar aggregate category. Where this detail can be found in the cash flow statement or in the notes, I have separately included it in the CARD.

- Unlike UK disclosure practices, US cash flow statements do not separately disclose the cash amount of income taxes paid nor the cash amount of interest paid. Where this information is not available, I have substituted the data from the income statement into the cash flow statement and adjusted the cash flow from operations accordingly.
- US inventory is valued using the LIFO method (last in first out) rather than the FIFO method (first in first out) as is standard in the UK. For my purposes this is not sufficiently material to warrant adjustment as inventory turnover will be fast enough that there should not be a large difference between “first” costs and “last” costs.

## Appendix 7 – 2011 Monte Carlo inquiry from Howdens Kitchens

### Monte Carlo

From: **Holson, Craig** (craig.holson@howdens.com)  
Sent: Thursday, March 17, 2011 1:58:16 PM  
To: ckelly@kellypartners.co.uk (ckelly@kellypartners.co.uk)

Chris,

Apologies for contacting you by email, but I do not have your telephone number.

I am contacting you following your article in the IIA magazine, and a recommendation from my CFO, Mark Robson, who, incidentally, gives you his regards.

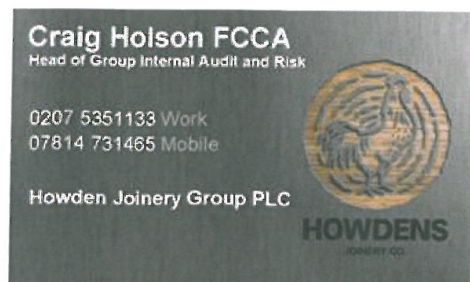
I will start with some background;

I am responsible for our risk process (not risk management) and the Internal Audit function. We utilise a simplistic risk management process, well defined, simple to use, and operates from bottom up, with a top down overview. I am comfortable with the end product, as it highlights to management / executives / board, the key risks and issues, and each priority, together with current and proposed mitigation plans. However, on certain risks, we lack a level of granularity, which is now required, for example, on deciding on investment options to increase resilience, each may show impact at maximum level (on scoring mechanism) and minimum likelihood. This does not give us the depth we need.

Hence one of the options I am looking at, to provide such granularity (or probability and impact) is Monte Carlo simulation. We have commenced this from a text book perspective, but feel it would be useful to get some expertise involved, even if purely from a high level perspective.

I therefore would be grateful if you could provide me with some time, or if you have any recommendations in terms of assistance in such a task.

Regards.





## Appendix 8 – 2011 Appreciative feedback on use of Monte Carlo from MTR Hong Kong

**From:** YU Henry Hon Kit (余漢傑) [HENRYYU]  
**Sent:** Wednesday, 17 August 2011 11:52 AM  
**To:** Chris Kelly  
**Cc:** Raymond O'Flaherty  
**Subject:** RE: Risk update for Enterprise Risk Committee Q3/2011  
**Attachments:** Enterprise RR May 2011 (existing).xls

Hi Chris,

Thanks for sharing a very information slide set with me. Interesting to note that you have close link between IA and ERM and the IA is using enterprise risks to drive the IA regime. We are doing more or less the same thing here in HK.

Anyhow, you guys seem more advanced than us as you also run Monte Carlo simulations to generate further view on your risk profile. Would be grateful if you can share a bit more with me how this is done in actual practice.

We are on the other hand thinking whether we should define our risk appetite / tolerance, but we are still at a very early stage on this.

Last but not least, kindly please can you send me your updated risk register for our reference and record purpose. Attached is the one I received from Michael in May for our ERC meeting in June for your reference.

Regards,

Henry Yu  
Enterprise Risk Manager

## Appendix 9 – 2012 AUD\$10 million cost savings target set by MTM Chief Financial Officer

Office Live Mail Print Message

Page 1 of 1

### Re: ICT implementations article

From: **Raymond O'Flaherty** (Raymond.O'Flaherty)  
Sent: Saturday, June 30, 2012 9:55:52 AM  
To: Chris Kelly (ckelly@kellypartners.co.uk)

Thanks Chris  
Also thank you for the chocolates.  
Very kind.  
Target next year \$10m  
You can do it.

Sent from my iPhone

On 30/06/2012, at 4:50 PM, "Chris Kelly" <ckelly@kellypartners.co.uk> wrote:

Raymond, Further to our conversation here is the article as promised. regards, Chris

<2006 04 01 Learning the lessons of failure.pdf>

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