

EFFECTIVE DECISION MAKING IN A LIFE COMPANY

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ABSTRACT

In the recent past life companies have made many decisions which they have had cause to deeply regret. This paper looks at the range of decision making theories available. It then examines recent examples of decisions that had unfavourable consequences and explores why they were taken, and goes on to describe a systematic approach to decision making which can help management assess more objectively the difficult choices confronting them today. The approach does not require espousal of any specific decision theory or method of value measurement. The focus is on the decision making process and the organisation's capacity to handle change. The paper identifies the three requirements for effective decision making.

KEYWORDS

Decision Making; Attitude to Risk; Accounting Standards; Measures for Success; Management by Inequalities; Resource Management

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The mark of a technologist which distinguishes him from the scientist is that he must act; everything he does must have some sort of deadline. He has to manage, therefore, with as much truth as is available to him, with the scientific theories current in his time. ... He must do the best he can. Decision making endeavours to seek truth, just as science does, but it operates on a different timescale.

Peter Moore

1. INTRODUCTION

1.1 A recent Staple Inn Actuarial Society paper (Froggatt & Iqbal, 2002) identified several instances during the last century when the United Kingdom life insurance industry faced collective ruin: the early 1930s, the late 1930s/early 1940s, and the mid 1970s. In each case the industry was saved by external events.

1.2 After a long bull period, the U.K. life industry is again in a crisis. Although relevant and comparable data are not available, we note that the free assets of with-profits life companies fell from 34% in 1985 to 6% in 2002

(expressed as a percentage of mathematical reserves plus required minimum margin; source: S&P database, Deloitte analysis).

1.3 These episodes of collective calamity make one wonder about the part which management has played in the decline, and what it could have done to mitigate it.

1.4 An occasional paper, issued by the Financial Services Authority (FSA) (McDonnell, 2002), analysing the causes of recent failures in European Union insurers, showed that: “management problems appear to be at the root cause of every failure or near failure”. These were found to fall into one of four general categories, the first of which was: “incompetence, straying outside their field of expertise or uncritically following herd instinct.”

1.5 A running theme in the Penrose Report (Penrose, 2004) has been the quality of management’s decision making and the absence of devil’s advocacy.

1.6 Analysing the quality of management’s decision making is something that some actuaries tend to ignore, although the recent paper, ‘Quantifying Operational Risk in General Insurance Companies’ (Tripp *et al.*, 2004), considered some of the behavioural issues.

1.7 The actuarial profession should take a greater interest in this subject. Actuaries hold positions of influence within life companies. Some of us are even chief executives or chairmen. Actuarial training teaches us to deal with probabilities. We are familiar with a world in which more things can happen than will happen, and are expected to make rational choices, based upon the probability and utility of each outcome.

1.8 In this paper we review the process of decision making in life companies. We begin by reviewing certain decision making theories. We then carry out a retrospective review of certain key periods when management was challenged, and speculate on how it might have arrived at its decisions. We then discuss issues that need to be taken into account when arriving at decisions.

1.9 This leads to the suggestion of a more disciplined approach which can help today’s management make objective choices. We refer to it as ‘management by inequalities’ (MBI). The focus is on the decision making process and its execution, rather than on the decision criteria. Some symbols have been used for clarity of definition, but the approach is essentially practical.

1.10 No originality is claimed for an approach that is, in one sense, no more than applied commonsense, and, in another, an instance of constrained optimisation.

1.11 Central to our thesis is the belief that it is more important for management to identify the key decisions, to assess their *relative* importance, having regard to internal capabilities, and to execute them properly, than to measure their worth accurately; or, to put it another way, it is better to be approximately right than to be precisely wrong.

2. DECISION THEORIES

2.1 Table 2.1 lists some of the decision making tools available. All of them rely on the concept of utility, the value of an outcome to the individual. This is influenced crucially by the individual's attitude to risk. The key distinction is between normative (or prescriptive) theories, which seek to identify the best decision based upon objective financial criteria, and assume that perfect information is available to all parties; and positive (or descriptive) theories, which take into account behavioural factors that cause a normative criterion to be modified. Further details are given in Appendix 2.

2.2 From the perspective of the owners of the business, whom we will call shareholders for convenience, normative theory would seem to be appropriate, so long as the decision rule allows for the degree of risk acceptable to them. That is what the FSA is seeking to establish with the concept of risk appetite and ruin probability.

2.3 Positive theories are necessary to explain what actually happens in practice. We need to know whether any deviation from pursuit of the shareholders' objectives is as a result of management failure (i.e. having the right strategy, but executing it poorly) or a consequence of management maximising its own utility rather than that of its shareholders.

2.4 Agency theory (Jenson & Meckling, 1976) suggests that the agents of a firm (which has a wide definition, but, for the purpose of this paper, includes management) have a tendency to expropriate from the company, because benefits to them are higher than the costs to them, as the bulk of the costs fall upon the myriad of shareholders.

2.5 In a free market, individual firms might do better or worse than their competitors; some may even fail. This paper looks at the industry as a whole, rather than at individual companies. To the extent that the industry has not succeeded, we need to ask ourselves whether this was due to one or more of:

- external drivers beyond control ('Act of God');
- inappropriate strategy; and
- poor execution.

3. EXTERNAL DRIVERS BEYOND CONTROL

3.1 Looking back over the past two decades, there have been four major external events which U.K. life companies have had to contend with:

- (1) a tilting of the level playing fields, whereby life assurance was put at a disadvantage vis a vis certain other forms of long-term savings;
- (2) changes in distribution;
- (3) changes in societal attitudes; and
- (4) decline in inflation, and the resultant changes in bond yields.

Table 2.1. Decision making theories

Theory	Normative/ positive	Description	Commentary
Utility	N	Decisions are made, not on expected monetary outcome, but on the subjective utility of those outcomes.	This states that people are generally risk averse, and that risk aversion decreases with increasing wealth.
Game	N	This is a rational game between known players, each acting rationally to maximise personal outcome.	Each participant has some, but not total, control over the outcome. All players are assumed to have complete knowledge of the choices available to each and the likely outcome of each possible action.
Prospect	P	Utility of outcome should be measured by the absolute amounts of gain/loss, rather than their impact upon total wealth.	Utility is a concave function for potential gains, but a convex one for potential losses; i.e. there is a greater aversion to a loss of £x than an attraction to a gain of £x.
Skill reputation	P	People do not mind backing decisions with low odds of success, as failure does not damage their reputation, but are wary of backing decisions with high odds, as failure might damage their reputation for skill.	Conservation of skill reputation can lead to seemingly irrational decisions.
Regret	P	People might go for a low probability/high outcome event, because they might regret not doing so if the outcome materialises.	Regret arises from the consequence of one's own decision rather than on an external event.
Herd behaviour	P	In certain circumstances people mimic the decisions of others, even if information available to them suggests that this could lead to a negative expected value.	It is safer to be in the herd, in case the information turns out to be unfounded.
Satisfice	P	Firms do not go for profit maximisation, but select a set of actions that are both satisfactory and will suffice.	One cause of non-rational decisions within an organisation is information overload.

3.2 The first of these started with the abolition of life assurance premium relief (LAPR), levelling the playing field. Tilting the other way happened with better treatment of capital gains on unit trusts and the deferral of tax relief on acquisition expenses on life business. Nevertheless, in a bull market, the industry was able to successfully compete for business.

3.3 The second arose from the deregulation of financial services in 1986, and the subsequent and periodically changing regulation of selling practices. The U.K. life insurance industry, which was used to gradual and incremental change and unobtrusive regulation, was ill-equipped to cope with such a major change. Management could not reasonably have foreseen that the call for redress might fall wholly upon life companies, irrespective of culpability, so long as the customer suffered disadvantage or loss. Nevertheless, it is probably the case that many did not attempt to do any long-range scenario planning or try to stay ahead of the game by managing public and regulators' perceptions.

3.4 The third led to the regulators introducing and enforcing standards that were not anticipated when some of these long-term policies were sold. It also led to the fettering of actuarial discretion.

3.5 The fourth was widely forecast in the early 1990s, but when it actually happened, later in the decade, it appeared to take the industry by surprise. This was odd, because rudimentary actuarial analysis (see, for example, Iqbal, 1997, 1998) would have alerted management to the need to take quick and decisive actions.

3.6 Some might argue that the three-year bear market in 2000 to 2002 was another major external event. An alternative view is that the problems that that caused arose out of the failure to take appropriate decisions in the past.

3.7 The tentative conclusion is that, whilst there have been significant external drivers, which were probably the major source of the industry's problems, at least for some of them management should have undertaken better long-range scenario testing and taken mitigating actions. So, inappropriate strategy and poor execution were major contributory factors too.

3.8 In the next section we examine, with the benefit of hindsight, decision making in two key periods during the last 15 years.

4. RECENT EXAMPLES OF DECISION MAKING

Captaincy is 90% luck and 10% skill but don't try it without the 10%

Richie Benaud

4.1 *Management in 1988*

In 1988, management was presented with a tantalising range of options when the Financial Services Act and the Social Security Pensions Act came

into effect concurrently. In practically every company, management resources were insufficient to properly think through the consequences of:

- (1) entering the personal pensions market;
- (2) operating under the evolving compliance regime of LAUTRO; and
- (3) competing in the market for distribution control, which was affected by both the Building Societies Act 1986 and the Financial Services Act 1986.

Black Monday had made many consumers wary of equity-based products. For completeness' sake, we should add that 1988 was the apogee of the era when seizing every opportunity was the accepted wisdom and when devil's advocacy was not in vogue. What happened was as follows.

4.1.1 With regard to (3), many companies did take a positive decision to focus on the IFA channel, but many others opted for a multi-channel strategy.

4.1.2 With regard to (2), the timetable was extremely tight, with many of the rules (for example regarding illustrations) not being known until very late in the day. Other rules, such as those for tied agents, were not understood clearly by life companies for some time. These were mandatory changes, but management had no real feel for the impact of the legislation or the sanctions for non-compliance.

4.1.3 With regard to (1), details of, for example, contracting out terms were known so late in the day that there were little realistic prospects of systems being ready on time. Nor was there adequate time for a realistic assessment of the feasibility of seeking transfers from defined benefit schemes, as the transfer terms were not generally known.

4.1.4 Nevertheless, most pension offices decided to solicit business of all of the types which the Social Security Pensions Act opened up: contracted out, contracted in, individual and group. In this they were helped by both the Government and the personal finance media, both of which favoured liberating people from the chains of employer sponsored schemes.

4.1.5 Resources for the implementation of these changes were limited. However, more resources would not have solved the problem, because the key issue was the organisation's capacity to handle change in a short-time frame without compromising on quality.

4.1.6 It is now clear that the driving force behind the decisions of 1988 was a desire to maintain/grow market share of new business. Generally, insufficient rigour went into any cost benefit analysis and, particularly, upon understanding the true cost of administering these products and of developing appropriate systems. With-profits companies probably did not adequately assess the capital implications. Success in writing with-profits personal pensions, on terms necessary to achieve that success, no doubt contributed to many mutuals running out of capital.

4.2 *Management in 1999/2000*

4.2.1 Around 1999/2000, any firm which was a player in the individual and group personal pensions markets had to face up to the coming of stakeholder pensions. Whilst this came into effect in April 2001, its impact was felt sooner, in terms of PIA's Regulatory Update 64. Management had to consider the following issues:

- (a) Future profit margins on its then book of business were under threat through competitor activity and regulatory intervention.
- (b) Available capital was under severe threat from the decline in bond yields and stock market volatility.
- (c) Margins on new pensions business were going to be, at best, wafer thin, possibly negative, and in any event very sensitive to the risk of poor persistency.
- (d) Computer systems were inefficient. The requirements of stakeholder, in any case, called for a completely new operational model, so either the existing systems had to be significantly modified/upgraded or new ones acquired.
- (e) If a firm chose not to compete in the market, and instead focussed on conserving its existing book, this would make it easier for its competitors to acquire critical mass.
- (f) If it chose to compete aggressively to acquire critical mass, it would have to cut charges and run the risk of making big losses if it failed to acquire the requisite volume, which was substantial.
- (g) It needed to prepare for potential systems' problems relating to year 2000.
- (h) It needed to manage the pensions' mis-selling review project to meet deadlines and to avoid the stigma of a well publicised fine.
- (i) An added complication was the need to comprehend the implications of the judgment of the House of Lords on the Equitable Life. In this analysis we will ignore it: firstly, because the judgment was delivered in July 2001, outside our time frame; and secondly, because certain aspects of the judgment could not have been anticipated.

4.2.2 Analysis carried out *at that time* showed that the market would not support a single provider unless it was expanded by a sustained attack on defined benefit schemes, and even then would support no more than half a dozen providers at the outside. It followed that firms should not have competed unless they realistically expected to be one of the half dozen winners; and even then they should have determined when would have been the best time to enter, using a variant of game theory to better understand competitor/consumer behaviour and regulatory response.

4.2.3 What happened was as follows. Most firms' actions suggested that securing distribution was the most critical concern and that maintenance/increase of market share was the prime corporate objective. Many sought to

compete for stakeholder pensions without adequately developed and tested systems. No attempt was made to expand the market by attacking the self administered defined benefit schemes. Most established pension providers cut their margins on existing pensions business, possibly without adequate regard for value conservation.

4.2.4 The decision to compete for stakeholder pensions and/or cut margins on existing pensions business was taken on the basis of:

- (1) an incomplete analysis of the expected risk relative to the potential reward; or
- (2) the risks and rewards being understood by some actuaries, but not fully explained to their board; or
- (3) the risk and rewards being understood by the board, but not fully explained to the shareholders; or
- (4) the risks and rewards being understood by the board and being consistent with the sort of risks (and rewards) which the owners expected to take (and enjoy). Perhaps they were attaching a large value to the need to be 'in the market' for longer-term gain.

4.2.5 The first three of these raise serious corporate governance issues. The final one, whilst rational, amounts to yielding hard money today in anticipation of a higher return tomorrow; a case of money for old hope.

4.2.6 In any event, the outcome was severe destruction of shareholder value and free assets, not just from the losses on the product, but because eyes were taken off the value conservation ball.

4.3 *Review of the Examples*

The evidence of these examples, and others which space prevents us from showing, suggests that the decision making process (whether to determine strategy or to execute it) was flawed. The key decisions facing firms were not identified with sufficient clarity, and insufficient attention was given to the firm's ability to effectively deliver the chosen decisions.

4.4 In general, the decision making *process* appeared to take one of three paths:

- (1) selecting those outcomes which had the potential to generate most shareholder value, based upon a rigorous analysis of the impact of some or each possible outcome;
- (2) selecting those outcomes which had the potential to generate most shareholder value, without regard to the firm's capability to deliver them; or
- (3) deferring decisions.

4.5 The first approach, which is relatively uncommon these days, could lead to a paralysis of decision making, given the torrent of issues that confront today's management.

4.6 The second is often based upon ‘instinct’ or hunch, with insufficient validation. Examples are new product developments based upon over-optimistic sales forecasts. Assessment of a firm’s ability to implement decisions is often based upon Murphy’s Inverse Law, viz. if anything *can* go right, it *will* go right.

4.7 There may be circumstances where deferring decisions is a rational act; for example, if the choice is between two decisions, where implementing the wrong one can have severe and irretrievable consequences, and where passage of time would make the choice clearer with little loss of value. An example would be whether to commence preparation for entry into the €. However, more often decisions are deferred when the rational choice is an uncomfortable one. Continuing to sell low cost endowments when it might no longer have been appropriate to do so is one example. A more potent one was the industry’s delayed response to the fall in bond yields. It is common, in such cases, to seek more analysis and research. Research can often illuminate, but it can also be the refuge of the timorous.

4.8 No decision making process, however good, can compensate for the wrong success criteria — for measuring the wrong things or measuring the right things in the wrong way. Throughout this period, excessive importance was attached to new business performance, initially purely in terms of sales performance, but more recently in terms of its profitability. However, the way in which trading performance and new business profitability are accounted for is inappropriate, and this has encouraged sub-optimal behaviour.

4.9 Companies routinely take credit for profit on sales of products that have not completely been built, and on which profit cannot, therefore, be reliably estimated. The expense assumptions often do not allow adequately for likely future costs and the yet to be incurred development cost of systems required to maintain policies. This allows firms to publish achieved profits, which subsequently would be shown to be impaired by these additional costs, and therefore were not fully earned.

4.10 In our opinion, this approach is inconsistent with SSAP 9, which states that attributable profits on long-term contracts are: “that part of the total profit currently estimated to arise over the duration of the contract, *after allowing for estimated remedial and maintenance costs* and increases in costs so far as not recoverable under the terms of the contract, that fairly reflects the profit attributable to that part of the work performed at the accounting date”. The italics are ours.

4.11 In the context of this paper, the result is that there is no restraint upon taking on more developments than can realistically be completed.

5. REVIEW OF DECISION MAKING IN A BEHAVIOURAL CONTEXT

We cannot observe others making choices, we only know what, in fact, they do, and how in fact they behave
W. H. Auden

5.1 Any analysis of management behaviour will be a generalisation, but any management team is likely to be subject to a number of drivers in addition to maximising shareholder value.

5.2 Game Theory probably does not apply, as shareholder value is not a fixed aggregate sum to be shared between life companies, and, in any case, they clearly do not participate in a zero sum game, as competition has led to destruction of value. Victory for the winners has come at a price, in that they have weakened themselves as well as the market. However, an important lesson from game theory is that the true source of uncertainty in business lies in the actions of others, i.e. competitors, regulators, customers, etc.

5.3 Shareholder value maximisation is the current management mantra, but if that is the goal, then evidence suggests that management has not executed it very effectively. It may be either that management is dissembling or, more likely that Simon (1958) is right in terms of outcome, if not in management intent; i.e. management settles for what is sufficient rather than for what is the best.

5.4 McDonnell (2002) suggests that management in companies that have failed may have “uncritically followed the herd”. Certainly, there is a tendency to benchmark against one’s peer group rather than look at the fundamental obligations to one’s customers and shareholders. Falling out of line seems to hold greater terror than getting things wrong. Why else did firms not adapt sooner to the low inflation environment? Banking and general insurance industries are examples of adjacent industries with similar inward myopia, both currently believing that: “This time things are different.” It may be, therefore, that ‘decision regret’ (Bell, 1983), or maintenance of ‘skill reputation’ (Holmstrom, 1982) is a driving force for some management teams.

5.5 We can, therefore, speculate that there may be a lack of congruence between the interests of management and the long-term interests of the shareholders.

5.6 It is now widely recognised that an inadequately constituted board, possibly with a dominant leader and inadequate counter point, is another cause of corporate problems. For example, David Strachan of the FSA told a recent Treasury Select Committee hearing that insurance companies with ‘dominance risk’ (i.e. where authority was concentrated in one or more dominant people on the board) would be more closely monitored by the FSA.

6. THE ROLE OF MANAGEMENT IN DECISION MAKING

6.1 The accepted wisdom is that the board determines strategy and management, then executes it. We will use the word ‘management’ to refer to both.

6.2 It must set the firm’s corporate goals, and then maximise shareholder value over time, however that may be measured, in a way consistent with them. This involves assessing the risks and opportunities inherent in dealing with future events.

6.3 The first step for management is to assess all of the potential risks, and to determine which of these are within its control and need to be managed, and which are not and need to be mitigated, and what their magnitude is.

6.4 Bernstein (1996) summarises this by saying: “The essence of risk management lies in maximising the areas where we have some control over the outcome while minimising the areas over which we have absolutely no control and the linkage between cause and effect is a hidden process.”

6.5 Uncontrollable risks, including, in Donald Rumsfeld’s memorable phrase, the ‘unknown unknowns’, are best avoided, but this may not always be possible. In any event, the firm’s risk appetite must be determined and communicated to all of its stakeholders.

6.6 In theory, the risk appetite adopted should be that of the shareholders, not of management. However, in practice this means that, having determined the risk appetite, management should articulate it to the investment analysts as well as to the investors, so that they can choose the extent to which they wish to invest.

6.7 Next, the opportunities available to the firm must be examined and realistically assessed, having regard to the future economic environment, consumer behaviour, regulatory changes, competitor positioning, etc.

6.8 Management needs to have a good understanding of the calls upon the firm’s critical resources from its existing operation and from any likely new developments.

6.9 To execute properly the strategy that it has set the firm, management must have:

- (1) a clear idea of how to compare the value of two competing choices, i.e. a definition of preferred outcome; this could be on the basis of maximising expected utility, or maximising minimum utility; or some other agreed criterion;
- (2) a formal process for prioritising decisions and allocating resources on the basis of an evaluation of available opportunities, having regard to the efficient use of *all* its critical resources, not just capital and IT, as is sometimes the case; and
- (3) an independent process for reviewing progress. A key issue is to understand the natural limit of change that a firm can absorb, beyond which putting more resources to address the problem is counter productive.

7. ORGANISATIONAL CAPACITY AND CAPABILITY

7.1 Table 7.1 sets out the critical resources management have to manage.

7.2 Some of these resources would be constrained, or can be expanded, only slowly and at a cost. Other resources can have asymmetrical build up and depletion; e.g. it can take a long time and a lot of money to build up sustainable brand values, but it is very easy to destroy them.

Table 7.1. Critical resources and capabilities

Type	Description
Management	Already considered in Section 6
Capital	The amount of capital available, the cost of servicing it, and the cost, and potential delay, in obtaining new capital
Labour	The amount of spare capacity, as well as the cost in terms of time and money, of recruiting and training additional person-power — the key is to have the right skills in the right place, at the right time, and at the right cost
Intellectual capital	The expertise and knowhow inherent in the organisation
Technology	The amount of developmental and processing capacity available on systems and hardware appropriate to run the business as usual and to support the initiatives under consideration
Channels to market	Access to customers for the delivery of the company's products
Competitive advantages	Brand, copyrights/licences and product differentiation can confer significant advantages — licenses and copyrights could have a shelf life that is either finite or, for practical purposes, unlimited
Corporate values	Integrity, progressiveness or teamwork, if ingrained in corporate culture

8. INTRODUCTION TO MANAGEMENT BY INEQUALITIES

The first lesson in economics is scarcity: there is never enough of anything to satisfy all those who want it. The first lesson in politics is to disregard the first lesson of economics Thomas Sowell

8.1. Good management, like politics, is the art of the possible. There are no perfect decisions, only better ones at the time when the decision is being made. The approach which we are propounding is built upon the recognition of three facts:

- (1) The most important issue which management needs to understand is: "What are the key decisions that they must address?"
- (2) It is not necessary to attach precise numeric values to alternative courses of action. It is sufficient to know which course of action is likely

to give the best outcome (on the agreed criteria) without needing to know its absolute quantum. That is usually a much easier question to answer.

- (3) We need to find a way to stop life companies taking on more projects than they can realistically expect to implement.

8.2 Consider a firm evaluating which of two choices to implement. These choices may be categorised, as set out in Table 8.1.

8.3 If it is not clear what the relationship between the two choices is. A detailed analysis of the relationship will give a useful insight into the decision to be made.

8.4 Mandatory decisions are normally a precondition of being able to continue to trade, although management could still have some discretion. It could, for example, choose not to trade, or it might have some flexibility in terms of the timing and rigour of implementation. However, if it does have some choice of this nature, the decision can be regarded as falling into one of the other categories or be split into two decisions, one of which is rigidly

Table 8.1. Types of decision

Type	Description	Example
Mandatory	Where management has no choice but to implement	Need to comply with the requirements of the Prudential Sourcebook or of the money laundering regulations
Mutually exclusive	Selection of one precludes selection of the other	(1) Buying one of two companies where buying both is not feasible (2) Outsourcing to an offshore location or retaining it in-house
Independent	Neither has any bearing on the other, either in terms of impact on outcome or competition for resources	Changing the asset allocation policy; or buying a new computer system
Parallel	The two are alternatives in whole or in part, but are not mutually exclusive	Buying distribution by taking a stake in an IFA or buying a competitor
Sequentially dependent	One cannot be exercised in whole or in part without the other	An established pensions office deciding whether to buy a new, or upgrade the existing, computer system, the decision for which hangs on whether it decides to enter the stakeholder pensions market or not
Mutually dependent	The exercise of one has a direct bearing on the other	A fund management firm entering the stakeholder pensions market and having to buy a new computer system

mandatory and the other falling into one of the other categories. A good example which is relevant today is the degree of rigour involved in assessing operational risk for the calculation of individual capital assessment (ICA).

8.5 For the purpose of this analysis, we will therefore ignore mandatory decisions. We note, however, that mandatory decisions restrict the organisational capacity available to deploy to other decisions, where there is a choice. In some circumstances, the total skills available in the market may be insufficient to implement a mandatory change. In these circumstances, management will need to make some very tough decisions.

8.6 Mutually exclusive decisions compete for management time. Critical to the evaluation would be the extent to which the mutually exclusive decisions compete for other resources and the relative rewards available.

8.7 Independent decisions compete only for management time. There may be few which fall into this category.

8.8 Parallel decisions also compete for other resources, such as capital, IT, distribution, intellectual capital, etc. Whether both can be implemented is a matter of resource planning priorities.

8.9 Dependent decisions cannot be taken in isolation. They come as part of a package.

9. THE APPROACH TO DECISION MAKING

There are 10 kinds of people; those that understand binary and those that don't

Anon

9.1 We begin by obtaining a clear understanding of the depth of critical resources available, *after* allocating the necessary resources for mandatory projects and for the day to day running of the business. The latter would include any enhancements necessary to meet current obligations to existing customers.

9.2 Next, we need to establish what decisions to consider. Framing the right choices is crucial to correct overall decision making.

9.3 Consider the simplest case of two mutually exclusive decision choices. (The approach to more complex decisions is set out in Appendix 3.)

9.4 Let us label them C_1 and C_2 , and the value generated by them VC_1 and VC_2 . We need to test the validity of an inequality such as $VC_i > VC_j$.

9.5 Sometimes this would be patently true or untrue by reference to ones own utility function. Shakespeare's Richard III famously said: "A horse, a horse, my kingdom for a horse." More often, each choice would have a probability of likely outcome and a range within which the benefit to the firm would lie.

9.6 If decisions were made purely on rational grounds, we can say that choice i is preferred to choice j if, and only if:

$$\iint \Pr(x, t) \cdot V(C_i(x, t)) > \iint \Pr(x, t) \cdot V(C_j(x, t))$$

where $\Pr(x, t)$ is the probability density function of scenario x at time t , and $V(C_i(x, t))$ is the present value of the rate of value generation at time t under scenario x for decision i . One integration occurs over all of the values of x , and the sum of all of the probabilities is 1; the other occurs over the lifetime of the expected outcome of the decision choice.

9.7 Paragraphs 9.1, 9.2 and 9.6 are the crux of MBI. In other words, have a clear understanding of the extent of critical resources available, distil the range of decisions confronting the firm into ones that really matter most, and then have a rational approach to evaluating their *relative* merits, considering a range of scenarios over a long time frame.

9.8 Like a mother's statements to her child, this might be considered very profound or trite. The truth is that successful management is about doing simple things well.

9.9 We need to evaluate $V(C_i(x, t))$. The approach typically adopted implicitly assumes that capital is the prime, possibly the only, constraint. That assumption might be valid when considering independent decisions, but needs to be tested when considering other types of decision.

9.10 Management is often a particularly critical resource. There will be other instances where technology or one of the other resources would be the critical limiting resource. Labour is an interesting one. It could be critical if there is either not enough of it with the right skills (and rapid recruitment or training is not feasible) or not enough of it at the right cost.

9.11 Suppose that there are four critical resources CR_1 , CR_2 , CR_3 and CR_4 , say management, IT, capital and channels to market. Together they constrain the firm's scope, and we need to determine a way in which to allocate the resources. If there is no impact upon any one of the critical resources, then the financial value can be calculated along orthodox lines. If there is an impact, then we need to find a way of allowing for it.

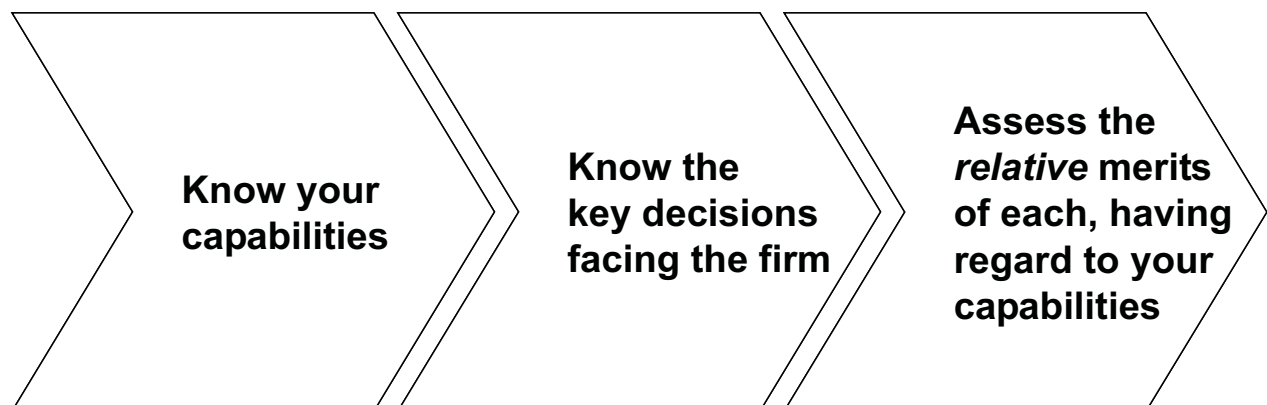


Figure 9.1

9.12 As we are considering comparative choices, precision is not necessary and, indeed, is misguided. If CR_1 is significantly more critical than CR_2 , CR_3 and CR_4 , the value generated by utilising it could be dampened by a weight, which in the limit could be a binary weight. Alternatively, the value ascribed to it may be limited to what can be supported by available critical resources. Other resources could then be disregarded as being non-critical.

10. MANAGING RESOURCE ABUNDANCE

10.1 There is empirical evidence to suggest that firms that do not have significant amounts of excess capital have managed their capital resources better than firms where capital has been plentiful, although we do not know whether this has statistical validity. This suggests that agency cost is high when there is capital to spare.

10.2 If capital is plentiful, but one of the other resources is critical, MBI can still be used if the evaluation is dispassionate. If all of the choices available can be met, and there is still excess capital, then returning excess capital to the shareholders becomes a choice.

10.3 Where another resource is in abundance, it may open up other choices. For example, if labour is in abundance, it could be cut back or spare capacity could be hired out. The decision would be guided by whether the excess is permanent or transient.

10.4 If there are no resource constraints, then there is either unfettered market dominance, or there are barriers to entry, or the competition is imperfect for some other reason. The likelihood of this changing should be investigated, and ways found to exploit the position for the benefit of all stakeholders.

11. MBI IN ACTION

We consider next some applications to see how MBI works in practice, and identify any modifications needed. We will start with a simple example, where the principles and issues are easier to identify, before moving to more complex ones.

12. EXAMPLE 1: MUTUALLY EXCLUSIVE DECISIONS

12.1 Consider a firm which was reviewing the asset mix of its long-term with-profits fund (LTAM) in the early to mid 1990s. The question was whether to increase its bond content from $x\%$ to $x + 10\%$, as recommended by the Appointed Actuary. We need to consider two decisions, increasing the

bond content in this way or leaving it unchanged, because inaction is also a decision. The decisions are clearly mutually exclusive and not parallel, independent or dependent. The only resources that could be critical are capital and management.

12.2 The issues to be considered in determining the optimal LTAM are:

- (1) consensus medium-term market prognosis;
- (2) the need to match guaranteed liabilities;
- (3) the amount and proportion of free assets available;
- (4) the shareholders' appetite for the risk of betting the free assets on the equity market;
- (5) the shareholders' and policyholders' appetites for the risk of betting the with-profits asset shares on the equity market;
- (6) the shareholders' appetite for risk of regulatory intervention if the firm's statutory solvency position is threatened; and
- (7) Policyholders' Reasonable Expectations and its successor, Treating Customers Fairly.

12.3 These considerations need to be combined into a single decision. The orthodox approach would assess objectively the merits of different asset mixes. The outcome might be along the lines of:

- $x\%$ in fixed interest; and
- $a \pm b\%$ in U.K. equities; etc.; etc.

with further guidelines on stock volatility and stock concentration.

12.4 This should enable the firm to assess the range of potential shareholder values emerging from the chosen LTAM, as distinct from a different one. Almost certainly it would require the use of stochastic modelling techniques which would take time: models have to be built; inputs validated; and outputs verified — six months to two years? So, a decision to stick at the current asset mix for the time being is taken by default.

12.5 MBI does not require absolute answers, only comparative ones. What difference would an increase in bond content by ten percentage points mean? Deterministic scenario testing would enable the firm to assess, relatively easily, the sensitivity to interest rate and stock market falls. The outcome in each of the scenarios of current asset mix and a requisite increase in bond content can be evaluated. What it will not tell you is the likelihood of any of the scenarios.

12.6 The key input from management is to decide which is more important, higher expected shareholder value or a less volatile one. The decision will probably be couched in relative, rather than in absolute, terms. Once that has been decided, it is quite likely that the approach suggested would give reliable guidance as to whether increasing the bond content by 10% is likely to lead to a better range of outcomes than leaving it unchanged.

12.7 If it is, then that decision may be implemented. In due course the

decision can be refined by further analysis, but at least one would have avoided inertia.

13. EXAMPLE 2: A MIX OF DECISION TYPES

13.1 Consider a firm which has problems with poor customer service, high expense ratios due to constant rework, and long lead times for product development. It is faced with the following choices:

- A — minor fixes to the IT systems and better training for customer services staff;
- B — developing brand new systems for new business;
- C — developing new systems for existing business;
- D — developing new systems for new and existing business, with a big bang conversion;
- E — developing new systems for new and existing business, with phased implementation;
- F — outsourcing new business processing; or
- G — outsourcing existing business processing.

13.2 The following sets of relative categories of decisions can be identified:

- | | |
|--------------------------|-----------------------------------|
| — Mutually exclusive | A/B, A/C, D/B, D/C, E/B, E/C, D/E |
| — Independent | B/C |
| — Sequentially dependant | B on A, C on A, D on A, E on A |
| — Parallel | B/F, C/G. |

13.3 In evaluating these competing options, management would have to make proper allowance for the availability of (making due allowance for known and likely future mandatory decisions), and calls upon, four critical resources: capital, technology, labour and channels. A fifth, possible damage to the brand, should also be given consideration. This (evaluation) is a major exercise, which should be undertaken in a structured and objective way. Usually the attractions of new systems are compelling, but proper allowance should be made for the hiatus during the transition. Not least of these is the lost business opportunities, as scarce resources are pre-empted by mandatory projects. In what follows, we shall assume that such objectivity exists.

13.4 First, we note the sequential dependencies.

13.5 Next, we consider the independent decisions and rank them by value. Does B generate higher value than C? Let us assume that it does, so that $VC_B > VC_C$.

13.6 Next, we consider the brace of parallel decisions. Is it better to outsource new business processing or build new in-house systems for it, or do

a bit of both? For the sake of argument, we will assume that the first option is the better.

13.7 Next, we compare the seven pairs of mutually exclusive decisions. Let us assume that the evaluations lead to the following outcome:

- $VC_B > VC_A$ and $VC_C > VC_A$, so that we eliminate A, but see later;
- $VC_D > VC_B$ and $VC_D > VC_C$; and
- $VC_E > VC_B$ and $VC_E > VC_C$.

13.8 We pause here for a moment and revert to English. We have established a straight choice between D and E. We are saying that it is better to develop brand new systems for both new and existing business, and the issue is whether to have a big bang change, with associated delays, or a phased approach. Note, however, that we have already established the premise that it is better to develop new systems for new business than for existing business. Thus, if a phased implementation is to be followed, developing new business functionality first should be considered. In either case, we note that there is a role for A.

13.9 The key to making the final decision is the rigorous analysis referred to in ¶13.3. The rigour is in identifying and evaluating every option, rather than in detailed analysis of a few favoured options. During the 1990s a number of companies were faced with precisely such choices. Some did not upgrade their systems; some went for big bang implementation; and others for a phased approach. Most have failed to achieve their original goals, possibly because planning was based upon the throwing of a succession of sixes, and:

- (a) not enough provision was made for the likely increase in mandatory changes; and/or
- (b) management had been unable to resist making changes whilst the systems were being built.

14. EXAMPLE 3: ANOTHER MIX OF DECISION TYPES

14.1 Here we consider the challenges faced by management in 1999/2000, as outlined in ¶4.2. We follow the same nomenclature.

14.2 Of the issues (a)-(h) outlined in Section 4.2, (g) might be regarded as being mandatory, as the perceived wisdom was that there was a clear risk of catastrophe if the risk was ignored. So must (h), even if, on a value analysis, it does not rank high enough. Hell hath no greater fury than a regulator spurned. That leaves us with (a)-(f), and they must compete for residual resources as well as for management time.

14.3 As we see it, there are the following generic decisions to be made:

- A — protect the available capital of the firm;
- B — protect the existing worth of the firm by defending the existing book;

- C — compete for new stakeholder pensions business;
- D — do not compete for stakeholder pensions business;
- E — do not compete for stakeholder pensions business; yet
- F — improve existing operational systems; and
- G — develop new operational models for stakeholder pensions.

14.4 Here A and B are dependent, but, on further reflection, A may be discarded, as it is covered by B, and would be a key criterion for selecting between C and E. D is more than just the complement of C, as it will entail a completely different strategy and set of actions.

14.5 It would seem that we can categorise the decisions as follows:

- Independent B/C
- Mutually exclusive C/D; D/E
- Parallel B/F; F/G.

14.6 First, we consider the independent decisions B, protecting the existing worth, and C, competing for stakeholder pensions. If they are independent we can do both if resources permit. However, preliminary analysis will soon reveal that C could be value destructive, and therefore is mutually exclusive to B. This is the most crucial decision of all the mutually exclusive ones, as the answer would have a bearing on other decisions.

14.7 We need a practical way of solving the inequality in ¶9.6. We need to explore various scenarios, and examine the outcome over a period of years, in a variation of game theory involving current and new participants, as well as the Government, the regulators and consumers. One of the scenarios to explore is the consequence of the company (and several others) choosing not to compete for stakeholder pensions, and leaving the market open to a few with the opportunity to churn non-participants' existing book. It may be that none of the scenarios is value enhancing. If so, we select the decision that is least value destructive.

14.8 Suppose that B prevails over C in terms of value. It does not follow that C should be rejected. For that, we need to consider the other two mutually exclusive pairs. Is it better to compete for stakeholder pensions than not to do so? The decision has to be justified, in the context of the fact that protecting the existing worth takes precedence. We suspect that, for most companies, a comparison of C and D would lead to D, but a comparison of C and E might just possibly have led to the conclusion that a later entry into the market, once the dust has settled and the pioneers have been scalped, might have merits.

14.9 On that basis we have voted in D and E. B and F are parallel decisions, and the question is whether the two done together would be worth more than doing either on its own. We need to understand what steps could be taken to protect the existing worth. Typically, they would involve retention of existing business, expense control, tax management and

investment strategy. F could assist in retention and expense control. The issue to consider is whether they would starve other value conservation activities of resources, and, if they do, whether they should.

15. MBI IN COMPARISON WITH OTHER DECISION MAKING THEORIES

15.1 In terms of philosophy, MBI is closest to Simon's (1958) satisficing. The latter may be regarded as a special case of MBI. Both MBI and satisficing avoid doing an exact computation of utility, it being sufficient to show that it is above a lower bound. However, MBI helps you go a stage further, and select the number of decisions which the organisation should make, and which these should be.

15.2 Use of MBI would assist in ensuring that management pursues the shareholders' objective rather than its own.

15.3 Of the other positive theories, MBI can work with prospect theory's concepts of risk tolerance. Management concerned with maximising shareholder value often regards the projects with the highest net present values as being the most valuable. MBI focuses on how many of these choices, important though they are in their own right, can reasonably be executed successfully.

15.4 In this way, MBI can be important tool in the management of operational risk.

16. WOULD MBI HAVE CHANGED DECISIONS IN THE PAST 16 YEARS?

Hindsight is the bane of history. It is corruptive and distorting and pays no respect to the way life is really lived — forwards, generally blindly, full of accidents, fortunes and misfortunes, patternless and often adrift
Melvyn Bragg

16.1 This is a difficult question to answer, because it is not easy to purge hindsight from our memory. Nevertheless, MBI would surely have steered management of most companies away from competing for stakeholder pensions, as capital and technology were (very) critical resources, and, in any event, marketing the product destroyed shareholder value in the short term with only a limited probability that it would create value in the longer term.

16.2 The big unknown is whether management, freed from addressing these issues, would have addressed value conservation in earnest. Would it have addressed, in a more timely way, the consequences of falling bond yields? Would it have resisted marketing pressure to cut margins on existing pension business?

16.3 We know that value conservation was not important enough on management's radar to have figured as a proactive decision. As we say in

¶9.2, framing the right decision choices is crucial. Would adoption of MBI have made sure that it was? We can only speculate.

16.4 With regard to 1988:

- It is doubtful if management at that time would have embraced MBI. That was the era of seizing all opportunities rather than risk management, and measures of success were similarly set. However, had it done so, MBI would have prevented it from backing too many horses with the same money. If a major mutual pension firm had chosen to defer launch by a year in order to have all the systems and controls in place, it would also have had the opportunity to assess the capital requirements. Although it would have lost market share, it would, today, be a much stronger firm, possibly retaining its mutuality.
- If, on the other hand, a proprietary firm had done the same thing, whilst it too would be much stronger today, there is a strong possibility that the astute management team would have been subject to pressure from investors and analysts, and possibly have been forced to resign. As politicians know only too well, you get no kudos for avoiding a disaster so effectively that no one was aware of it. This is an instance of non-alignment of the interests of management and the owners of a business.

17. A TEMPLATE FOR THE FUTURE

The truth is that our friends — and our enemies — always know us better than we know ourselves
W. H. Auden

17.1 The approach described in this paper is applied common sense. Good management is about doing simple things well.

17.2 The risk of history repeating itself in the future might be greatly reduced if:

- (1) Firms were required to publish in their annual report a statement of their critical resources and how these were deployed. Failing that, the FSA should require them to develop an appropriate resource utility function when assessing their ICA. The present approach, which relies only upon capital adequacy (hence ICA, not IRA), is inadequate.
- (2) Behavioural psychologists were used to analyse the management team's attitude to risk to assess which behavioural type best describes them. In particular, steps could be taken to ensure that management pursues the interests of the shareholders rather than its own, and that sufficient information is presented to the board and shareholders to demonstrate this. This is a corporate governance issue that could apply to all public companies, but is especially relevant to life companies, because of the intangible and long-term nature of the products and services, as well as information asymmetry between management and the shareholders and customers.

- (3) The management team had the right blend of skills and was to use MBI as a key decision making and operational risk management tool. Proof of this would be in the demonstration that the firm takes on no more initiatives than its resources can actually deliver, and delays the launch of products or services until they are ready.
- (4) The management's reward system was such as to more closely align management's actions with those of the shareholders' long-term interests.
- (5) New accounting standards were developed which, *inter alia*, regard, as a charge on profits, the present value of all future costs necessary to deliver to its customers all that has been promised in terms of service. If current operating costs are lower because certain of these services are not being provided satisfactorily, or not at all, a suitably higher cost should be charged instead.
- (6) These charges were recalibrated every year to take into account any potential slippage.
- (7) External performance reporting was no longer based upon the new business sales measure currently used, of annual premium equivalent. Instead, the new accounting measure of profits should be supplemented by additional relevant key performance indicators (KPIs) such as net new monies and gross margins on it; increase in funds under management; investment performance compared to benchmark and customer service; and satisfaction metrics.
- (8) Management was to set aside adequate thinking time to think through major changes that could threaten the industry in the future. Current examples include longevity risk, likelihood of terrorism destabilising, for example Saudi Arabia, return of inflation and assessing the limit of consumerism and blame culture, and whether, and if so when, that limit is going to be reached.

17.3 One other change which would be useful is to require that the determination of a firm's profit was not within the gift of its management, but independently computed (as distinct from being audited). This would protect the shareholders in the same way the With-Profits Actuary is deemed to protect the with-profits policyholders. However, it is unfair to single out life companies for special treatment, as the same challenge exists in all public companies.

17.4 These changes would have the effect of reducing the level of reported profits (and dampening their variability), which would be offset in due course by:

- (a) reduced capital requirement, as the FSA comes to believe that firms are better managed; and
- (b) more stable share prices, as analysts come to believe that profits are more real and durable and justify higher price/earnings ratios and lower betas.

17.5 Although such an approach will make sure that life companies are much better run and make fewer mistakes, it will not eliminate risk altogether. The key to successful management is identifying the key decisions facing it, and then making the right choices. There is no guarantee that management of the future will respond any better to *fundamental* changes, such as those referred to in ¶3.1. In such circumstances, ones past experiences become blinkers rather than acting as a beacon.

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19. REFERENCES

The literature on decision theory is very wide, and I have read only a small fraction of it. Here is a list of references relevant to this paper upon which I have relied.

- ARROW, K.J. (1965). *Aspects of the theory of risk-bearing*. Helsinki Yrjo Hahnsson Foundation.
- ARROW, K.J. (1971). *Essays in the theory of risk bearing*. Markham Publishing.
- BELL, D.E. (1982). Regret in decision making under uncertainty. *Operational Research*, **30**, 961-981.
- BELL, D.E. (1983). Risk premiums for decisions regret. *Management Science*, **29**(10), 1158-1166.
- BERNOULLI, D. (1954). Exposition of a new theory on the measurement of risk (translated from Latin) in *Econometrica*, **22**, 23-36.
- BERNSTEIN, P.L. (1996). *Against the gods, the remarkable story of risk*. John Wiley & Son.
- BREALEY, R.A. & MYERS, S.C. (1988). *Principles of corporate finance*. McGraw Hill.
- DE BONDT, W. & THALER, R.H. (1985). Does the stockmarket overreact? *Journal of Finance*, **XL**(3), 793-807.
- FROGGATT, H.W. & IQBAL, M. (2002). Smashing with profits business. Paper presented to the Staple Inn Actuarial Society.
- GOFORD, J. (1985). The control cycle: financial control of a life assurance company. *Journal of the Institute of Actuaries Students' Society*, **28**, 99-114.
- HOLMSTROM, B. (1982). Managerial incentive problems — a dynamic perspective. *Review of Economic Studies*, **66**(1), 169-182.

- IQBAL, M. (1997). Single currency, Bacon & Woodrow seminar slides.
- IQBAL, M. (1998). EMU and the single currency. Life Convention talk.
- JENSON, M. & MECKLING, W. (1976). Theory of the firm: managerial behaviour, agency cost and ownership structure. *Journal of Financial Economics*, 305-360.
- KAHNEMAN, D. & TVERSKY, A. (1979). Prospect theory: an analysis of decision under risk. *Econometrica*, **47**, 263-291.
- KAHNEMAN, D. & TVERSKY, A. (1992). Advances in prospect theory: cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, **5**(4), 297-323.
- KEYNES, J.M. (1921). *A treatise on probability*, Macmillan & Co.
- KEYNES, J.M. (1934). *The general theory of employment, interest and money* (paperback edition) (1997). Prometheus Books.
- LEWIN, C.G., CARNE, S.A., DE RIVAZ, N.F.C., HALL, R.E.G., MCKELVEY, K.J. & WILKIE, A.D. (1995). Capital projects. *British Actuarial Journal*, **1**, 155-249.
- MCDONNELL, W. (2002). Managing risk: practical lessons from recent 'failures' of EU insurers. FSA occasional paper 20.
- MORRIS, S. (2001). Political correctness. *Journal of Political Economy*, **109**(2), 231-265.
- MOORE, P.G. (1979). Are objectivism and subjectivism compatible concepts? *Journal of the Institute of Actuaries*, **107**, 11-47.
- PENROSE, LORD (2004). *Report of the Equitable Life Enquiry*.
- SCHARFSTEIN, D. & STEIN, J. (1990). Herd behaviour and investment. *American Economic Review*, **80**, 465-479.
- SIMON, H. (1958). *Organisation*.
- SIMONS, R. (1999). How risky is your company? *Harvard Business Review*, 85-94.
- TRIPP, M.H., BRADLEY, H.L., DEVITT, R., ORROS, G.C., OVERTON, G.L., PRYOR, L.M. & SHAW, R.A. (2004). Quantifying operational risk in general insurance companies. *British Actuarial Journal* (to appear).
- TVERSKY, A. & KAHNEMAN, D. (1992). Choice values and frames. *American Psychologist*, **39**(4), 341-350.
- TVERSKY, A. & KOEHLER, D.J. (1994). Support theory: a nonextensional representation of subjective probability. *Psychological Review* **101**(4), 547-567.
- VON NEUMANN, J. & MORGENSTERN, O. (1944). *Theory of games and economic behaviour*. Princeton University Press.

APPENDIX 1

GLOSSARY OF UNITED KINGDOM TERMS

Annual premium equivalent. This is a common measure of new business performance. It is equal to 100% of regular premium plus 10% of single premium.

ICA. Individual Capital Assessment. The Financial Services Authority, as the prudential regulator, requires companies to make their own assessments of their capital requirements, having regard to market, credit, liquidity, insurance, operational and group risks.

LAPR. Life Assurance Premium Relief. In the U.K., until 1984, life assurance policies meeting certain requirements were given tax relief on premiums as an encouragement to long-term savings.

Regulatory update 64. This was issued by PIA, the predecessor to the FSA, and stated that the sale of any pension product which had poorer terms than stakeholder pensions when that was introduced and switching from which to the latter involved penalties, would, prima facie, constitute mis-selling.

With-profits fund. In the U.K., a life company has to create a long-term fund, separate from the shareholders' fund, relating to its long-term insurance business; the with-profits fund is a sub-set of it.

APPENDIX 2

REVIEW OF DECISION MAKING THEORIES

The process and rationale behind decision making has fascinated mathematicians and economists for the past four centuries, and, more recently, behavioural psychologists as well. There is a vast body of literature, and we will highlight only a few relevant ones.

Probability theory underpins the study of rational decision making, and the pioneering roles of Laplace, Pascal and Fermat must be acknowledged. However, it was Daniel Bernoulli who first introduced (in 1738) the concept of *utility*. He suggested that people do not evaluate prospects by the expectation of their monetary outcomes, but by the expectation of the subjective value, utility, of those outcomes. He suggested that people are generally risk averse, and that risk aversion decreases with increasing wealth. In other words, the utility was a concave function of money. For example, a sure gain of £800 might be preferred to an 80% chance of winning £1,000 (with a 20% chance of winning nothing).

Bernoulli's concept of rational utility led, amongst other things, during the 19th century, to the economists' law of supply and demand.

A2.1 *Bayes' Theorem*

Bayes' Theorem was published posthumously in 1763 by Richard Price in *An Essay towards solving Problem in the Doctrine of Chances*. It introduces the concept of conditional probability, and enables us to incorporate information, e.g. from an observation, to produce a modified or updated probability distribution. The classic formula is:

$$\Pr(A | B) = \frac{\Pr(B | A) \cdot \Pr(A)}{\Pr(B)}$$

where $\Pr(A)$ is the prior probability of A , i.e. without any information about B , and likewise for $\Pr(B)$. $\Pr(A | B)$ is the posterior probability of A given B , and is derived from specific information about B . The term $\Pr(B | A)$, for a specific value of B , is called the likelihood function for A .

Its relevance to decision making is that it provides a rational way of re-computing the odds of an outcome as new information becomes available. If there is information asymmetry between various contestants, then it can be seen that they might come up with different odds for the same outcome.

A2.2 *Theory of Games*

During the 1940s von Neumann and Morgenstern developed their Theory of Games. A game is a conflict between a number of participants, each of

whom has some, but not total, control over the outcome of the conflict. All players are assumed to have complete knowledge of all actions, moves or choices available, both to themselves and to their opponents, and knowledge of the results of any conflict associated with any given selection of actions. Each player is expected to act rationally to maximise gain. Games are described in terms of their characteristic function, which measures the strength of possible coalitions amongst players. Two axioms emerging were:

- each player will seek to maximise his own security level; and
- players will gravitate towards strategy pairs that are in equilibrium.

There have been other developments in a rational approach to decision making. Common to them are the principles of dominance and invariance. Dominance means that, if choice *A* is at least as good as choice *B* in every respect, and better than *B* in at least one, then *A* should always be preferred to *B*. Invariance states that the preference order between choices should not depend upon the manner in which they are described.

Perhaps the biggest lesson from game theory is the realisation that the true source of uncertainty in business lies in the intention of others, be they competitors, regulators, customers, or their champions.

A2.3 *Prospect Theory*

In 1979 Kahneman & Tversky published an alternative theory, curiously named the prospect theory. They argue that the subjective value or utility of outcome should be measured by the absolute amount of gains or losses, rather than by their impact upon the total wealth of the individual. They also suggest that people tend to overweight small probabilities and underweight large probabilities.

An example used by them is worth repeating. Consider a lottery that has a single prize of £300, for which you have been given a single ticket. The value of the ticket would lie in the range zero (when the chance of winning is nil) and one (when winning is a certainty). Kahneman & Tversky suggest that the value of the ticket is a non-linear function of the probability of winning; that an increase from 0% to 5% has a bigger effect than an increase from 30% to 35%, which is also smaller than an increase from 95% to 100%.

This suggests that the subjective value or utility is a concave function of potential gains, but a convex one for potential losses. Kahneman & Tversky describe the phenomenon as loss aversion, whereby a loss of £*x* is more aversive than a gain of £*x* is attractive.

They also refuted the invariance rule, and demonstrated, by empirical research, that how you frame your choice can have an important bearing on subjective preferences or utility. A classic experiment of theirs is worth relating.

They postulated that the United States of America was preparing for the outbreak of an unusual Asian disease which was expected to kill 600 people.

Two alternative programmes to combat it were proposed. If programme A is adopted, 200 people would be saved; with programme B, there is one in three probability that all 600 would be saved, and a two in three probability that none of the 600 would be saved. The two have identical rational expectations. In fact, 72% of the people in the sample chose the certainty of saving 200 lives.

The same programmes were then re-expressed as follows. If programme C is adopted, 400 people would die; if programme D is adopted, there is a one in three chance that no one would die and two in three probability that all 600 would die. This time 78% of the people in the (different) sample chose to avoid the certainty of 400 deaths.

De Bondt & Thaler (1985) have suggested that, rather than processing new information in an objective Bayesian way, individuals overweight the new information rather than do a rational re-evaluation by putting the new information in its proper context.

A2.4 Skill Reputation Theory

Another way to look at prospect theory in a business context is that, when the odds of success are low, failure is common and is likely to do little damage to one's reputation, since one's peers are likely to fail as well. If the odds of success are high, failure can be embarrassing, because one's failure can be put down to incompetence.

Holmstrom (1982) suggested that, in a business context, the conservation of skill reputation, of either the manager or the firm, can induce seemingly irrational behaviour. He used evaluation skill, used to understand distorted investment decisions.

Some decision makers are better than others at identifying the exact odds of a gamble.

A2.5 Regret Theory

Bell (1982, 1983) developed regret theory, suggesting that people might go for low probability/high value outcomes, because they might regret not having done so if the outcome materialises. Regret arises from the consequences of their own decision rather than any external event.

An obvious example given by him is as follows. You are given a lottery between £10,000 and £0. The die is cast and you do not win. You are disappointed, but accept it. Suppose, instead, that you had been given a choice between £4,000 for certain or the said lottery, and you chose the latter. How would you feel when you win nothing? Alternatively, if you had chosen £4,000, and then find that you would have won £10,000 on the lottery, how would you feel?

Bell developed a utility analysis for assessing the risk premium that decision makers would be prepared to pay to avoid regret. He introduced the concept of 'foregone final assets'.

The outcome of the gamble may be observable, even if not taken, so that the failure to take a gamble that wins might be more embarrassing than taking a gamble that fails. This suggests that low probability outcomes are over-weighted in evaluating choices.

If the regret function is more concave for negative outcomes (the realised outcome is the worse outcome), then it would corroborate prospect theory.

A2.6 Comparison of Regret and Skill Reputation Theories

Both skill reputation and regret theories suggest that decision makers are more willing to take a chance on gambles that observers recognise as long shots, and reluctant to take gambles where success is expected.

Keynes (1934) had said as much, more vividly: “Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally.”

Regret theory is driven by the relative sizes of the realised and unrealised outcomes, while skill reputation is driven by how different probabilities of success affect the observer’s updating of the decision maker’s skill. This may lead to people opting for a course of action leading to negative gain (such as competing for stakeholder pensions), if not to do so might be perceived as reflecting uncertainty of one’s own skill.

A2.7 Herd Behaviour

Scharfstein & Stein (1990) found that, in certain circumstances, investment managers simply mimic the investment decisions of other managers, disregarding information available to them which suggested that such an approach would lead to negative expected value. This is because it is safer to be in the herd (‘sharing the blame’), in case your information turns out to be unfounded. The comfort of sharing the blame outweighs the potential gain if your information is vindicated, and you gain a competitive advantage.

A2.8 Satisfice

Simon, a Nobel Laureate for his “pioneering research into decision making within organisations”, argued that firms did not behave in the rational profit-maximisation way in which economists assumed that they would (Simon, 1958). This is partly because getting information about alternatives is costly, and the consequences of some possible decisions cannot be known. Instead of maximising their utility, they ‘satisfice’, i.e. they do as well as they think possible. He proposed that, because of their members’ bounded rationality and often contradictory goals and perspectives, firms reached decisions that can only be described as satisfactory rather than the best.

Simon recognised that the inhibitor to making good or rational choices within an organisational context was not information scarcity, but information overload.

A2.9 *Application of Utility Theories to Corporations*

Much of what has been outlined in this Appendix relates to decision preferences of individuals.

It is contended by financial economists that corporations or firms owned by shareholders should simply act to increase shareholder value, which is equivalent to selecting projects which have positive net present value. This does not always happen, because companies are run by managers, not shareholders, leading to agency costs (see ¶2.4).

It is argued that they do not have to postulate a firm utility function to enable them to do this. Capital markets exist to enable shareholders to trade shares, buy, borrow and sell, in order to satisfy their own consumption preferences, which could, in theory, be determined from their individual utility functions.

APPENDIX 3

MANAGEMENT BY INEQUALITIES

Let us consider a rational approach to each type of decision. In what follows, value is computed over the expected lifetime of consequences of the decision under consideration.

A3.1 *Mutually Exclusive Decisions*

This has already been covered in Section 9.

A3.2 *Independent Decisions*

Let us consider a number of independent decisions and label the i th decision choice C_i , and the value generated by it VC_i , computed in the same way as for mutually exclusive decisions. The suggested approach is to pair two choices and see which gives the higher value. Here again, symbolically:

$$\max\{VC_i, VC_j\}$$

determines which of the two choices is preferred. The less valuable option is discarded, and the other paired with the next decision choice, and the process continued until all choices have been evaluated and a winner emerges. With n choices, $(n - 1)$ pairings have to be gone through.

A3.3 *Approach for Parallel Decisions*

Here the issue is whether to run with one of the two or both. Symbolically, we are seeking:

$$\max\{VC_i, VC_j, V(C_iC_j)\}$$

where VC_i and VC_j are values arising from i th and j th decisions taken in isolation, and $V(C_iC_j)$ where the two are taken together. Note that $V(C_iC_j) \neq VC_i + VC_j$. These values are calculated in the same way as for mutually exclusive decisions.

A3.4 *Suggested Approach for Dependant Decisions*

This is more complicated. Where the two choices are linked, a whole range of choices is feasible. In the sequentially dependent decision in ¶13.2, a range of choices is possible on both product marketing mix and administration platform. The search is for a combination that maximises:

$$\{\max V(C_iC_j) - \max[\max(VC_i), \max(VC_j)]\}$$

where C_i and C_j represent continuous ranges of choice of a broad generic

type. The outcome would be a specific version of either C_i or C_j in isolation, or specific forms of C_i and C_j in combination.

A3.5 *A Mix of Parallel, Independent and Dependent Decisions*

This would be more common in real life. A practical solution would be to use the same pairing technique, separately on each type of decision, so as to arrive at the best choice from each. Then the three could be ranked by first pairing the dependent and the independent. However, the nature of the decisions would determine whether a different route is better. See, for example, Section 13.

A3.6 *Multiple Decisions*

So far, we have implicitly assumed that only one decision is going to be implemented. In practice, more may be accommodated. If so, a variation of the approach could lead to the following inequality, where the subscripts are in decreasing order of value:

$$VC_1 > VC_2 > \dots > VC_n.$$

A3.7 *Caveat*

We have not established that, if:

- $VC_1 > VC_2$; and
- $VC_2 > VC_3$; then
- $VC_1 > VC_3$.

If all three choices rely on the same critical resources, then this statement is easy to demonstrate. Where that is not the case, it is not obvious that the inequality series would always be so linear. If the weighting attached to each critical resource is independent of each other, then linearity would still hold. However, if they did not, then linearity may not hold. No theoretical solution can be offered for this. The nature of the dependence would need to be examined to determine whether pragmatism can prevail or whether a complex set of decisions needs to be addressed.

Of course, more than one decision could be implemented, so long as management can devote enough time to each, and their combination does not hit one of the other critical resource constraints. The hierarchy of inequalities facilitates this.

Suppose that we are testing the proposition that n decisions can be implemented. The initial premise is that these would be the first n in the inequality. However, with each of these decisions we have tested for resource utilisation, looking at that decision in isolation. In practice, the sequence might change.

The theoretical approach would be to consider the two highest value non-mutually exclusive decisions, and see if doing both hits a fresh resource

constraint. If it does, then the combined value is appropriately reduced and compared with another pairing (say the first and third, or the second and third), and the process repeated. When the best pair is found, then it is combined with a third, and the process continued; and so on, until the natural limit of the organisation is reached.

Note that the number of multiple choices to be evaluated rises rapidly as the number of decisions desired increases. In practice, if management has a clear idea of the available critical resources, it should be able to proceed more quickly, once the initial hierarchy of inequalities is obtained.