

Who Wants to be a Millionaire?

by Warren Edwardes, CEO, Delphi Risk Management

In brief

This article examines hedge choice and performance measurement. Important lessons are learnt from the strategies employed in popular game shows such as 'Who wants to be a millionaire?'

The author describes the probability calculations underlying choices in such games and discusses the underlying chances of wins on UK Premium Bonds and the National Lottery. He outlines the parameters of the 'to hedge or not to hedge' debate and emphasises the necessity of introducing a way for a finance director and his treasurer to select a hedge given the nature of their institution's appetite for risk, its performance measurement yardstick and its forecasts on rate direction.

ON a casino's roulette table a zero and often a double zero are acceptable to gamblers. A player can walk away from the game (usually!) with, at most, the funds brought to the table lost. He puts up limited capital. The casino has an unlimited capital exposure and cannot, other than through bankruptcy, turn clients away.

'Who wants to be a millionaire?' is now a worldwide television game. You are in the hot seat. The host hands you a cheque for half a million pounds (or dollars or euros or...) but snatches it away saying "But we don't want to give you that!". You now have the final question ahead of you for a million. You have already used up your lifelines. You've asked the audience; you've phoned a friend and you've had the computer take away two of the choices under the 50-50 lifeline. In short, with no lifelines left, you feel no more than 60 per cent certain of which of the remaining two possibilities is the right answer. Do you take a guess? If you are right you win £1million. If you are wrong (40 per cent probability) you go home with £16,000. So the expected outcome if you guess is £606,400. But you take the money and go home as you can leave with a substantial £500,000. Many contestants, quite rationally, take the money and stop playing the game – even if on a simplistic probability calculation they should continue. The value of the certain substantial gain in-hand outweighs the possible benefit through a chance win of a larger sum. The decision all depends on the value of the £500,000 in hand. Bill Gates might well

take a chance if he is 60 per cent sure he is right. The consequences to him if he is proved wrong are trifling. But most people would focus on the loss of £484,000 rather than the possible gain of £500,000 and be reluctant to gamble it away even if they are almost confident. This is rational behaviour that has applications to treasury and funds management. Most people and most firms are risk averse.

Premium Bonds

I find the UK's Premium Bonds fascinating in terms of learning about investor psychology. Premium Savings Bonds are a UK Government security offered to individuals and issued by the UK Treasury through the National Savings Agency. This retail savings financial instrument pays no interest. In lieu of interest, the £1 nominal bonds are included in monthly draws for cash prizes. These prizes are free of all UK Income Tax and Capital Gains Tax. There is a prize fund for each month that is equal to one month's interest on each Bond eligible for the prize draw for that month.

Herein lies the essence of risk and reward. Unlike bets with the UK National Lottery or any other gamble, capital, other than through the ravages of inflation, is preserved. Interest of £1,000 for a £20,000 bond-holder is foregone for the chance to win prizes of up to £1m. In the UK National Lottery, only half of the ticket income is used to fund prizes. So to approximate to a maximum Premium Bond investor, someone betting £10 twice a week for 50 weeks on a

lottery would expect a return of minus 50 per cent or winnings of £500 per annum. And there is no shortage of 'investors'. Lottery players dream of becoming millionaires and are prepared to forgo limited ticket purchase money. And investors/gamblers are quite rational. That is because for a limited loss and an almost unlimited gain they are prepared to accept poor expected returns.

The UK bank Alliance & Leicester entered accounts opened in 1999 into a weekly prize draw to double their money. But beware of imitating such structures, as lotteries are regulated in most countries and in the UK National Savings has a monopoly.

To hedge or not to hedge

Boards have been for some time apprehensive about derivatives following the losses sustained by firms such as NatWest Bank on badly priced interest rate caps, Barings Bank on Nikkei futures, Procter & Gamble on structured geared swaps, Allied Irish at its US subsidiary Allfirst and many others. Some were not the fault of classical derivatives contracts at all. In one particular case it was credibly argued that the losses arose not because of the original derivatives contracts but because of the unwinding of the contacts.

On the other hand, the successful case by the shareholders of a grain co-operative in the US against its board of directors for failing to hedge exposures suggests that avoiding derivatives is not a safe option. Ignominious ignorance isn't

blameless bliss. A US Court of Appeal has ruled that “directors breached their duty in failing to supervise (the) manager and become aware of essentials of hedging to be able to monitor businessthe primary cause of the gross loss was the failure to hedge.” Corporate and bank boards of directors and central bankers are rightly concerned about their firms’ exposure to risk management instruments. The court case, however, suggests that throwing the risk management baby out with the derivatives bath-water can be equally dangerous.

What could send shivers down many a directorial spine is the court thinking behind its finding that the co-op’s directors breached their duty of care. They breached their duties by retaining a manager inexperienced in hedging; failure to maintain reasonable supervision over him; and failing to attain knowledge of the basic fundamentals of hedging to be able to direct the hedging activities and supervise the manager properly; and that their gross inattention and failure to protect the grain profits caused the resultant loss. The directors argued that they relied upon their manager and should be insulated from liability, the court ruled that ‘the business judgement rule’ protects directors from liability only if their decisions were informed ones.

As derivatives have become commonplace, the Indiana case does not appear to have been used as a precedent. And the BIS and central bankers regularly express their fears over the burgeoning market in derivatives. Boards have in the past blamed unforeseen ‘adverse exchange rate movements’ at their AGMs to explain away their losses.

But equal attention must be paid to the management of ‘natural’ exposures generated by on-balance-sheet assets or liabilities. Will, for example, the non-executive directors of a Savings Bank be comfortable in allowing their treasurers to offer a supply of fixed rate mortgages without a swap to hedge interest rate exposure?

The losses at insurance companies such as The Equitable totalling some £14 bn in relation to guaranteed annuity rates on policies could well have been mitigated through using derivatives. The problem arose in the late 1980s when most pension funds in the UK wrote pension policies guaranteeing minimum annuity rates. A combination of falls in interest rates and lower mortality rates has made these guarantees valuable to policyholders. It has been suggested that the problem arose from the ‘fall in long-term interest rates’. It is true that rates

What was God's Utility Function? If there is only one Creator who made the tiger and the lamb, the cheetah and the gazelle, what is He playing at? Is He a sadist who enjoys blood sports? Is He trying to avoid overpopulation in the mammals of Africa? Is He manoeuvring to maximise David Attenborough's television ratings? These are all intelligible utility functions that might have turned out to be true. In fact, of course, they are all completely wrong. The true Utility Function of life, that which is being maximised in the natural world, is DNA survival"

River Out of Eden: A Darwinian View of Life, Richard Dawkins, Basic Books, 1996

did fall substantially and unexpectedly. But the problem for the insurance companies arose because of their collective failure to manage the risks inherent in the interest rate insurance policies sold to annuity policyholders. They should have taken out interest rate insurance.

There had been much discussion as to who should bear the strain – policyholders or shareholders. But insurance company management should have faced up to the responsibility for failing to use derivatives techniques, explicitly or implicitly, to manage the interest rate risk. The mismanagement of derivatives on a considerably smaller scale has led to jail, dismissals or resignations at Barings, NatWest, UBS, Hammersmith & Fulham, Allied Irish and elsewhere. The fall in interest rates had led to substantial gains in the fixed income portfolios of life companies. Is the UK Treasury entitled to reduce its rates on long-term government bonds it had issued because rates have fallen? Of course not! It is two decades since futures and options arrived in the UK. Even if derivatives are not explicitly used, ignorance of risk management techniques is no longer an excuse for failing to use them. And most of the major banking losses have not occurred through derivatives at all but through plain old-fashioned ill-judged lending.

When I set up the new products development desk at a UK bank in 1984, my first task was to get the legal documentation and risk management in order for the then new products such as options, swaps and FRAs. But the documentation for forward exchange contracts was but a few lines. Why the inconsistent fuss for instruments that generated much lower risk? And there was no special risk management policy even for long-term fixed rate loans that could be regarded as floating rate loans plus fixed/floating swaps. Many UK government bonds had dual maturity dates. They matured at any time between two dates. And most floating rate notes had embedded minimum interest rates. No

special derivatives policy was required for such instruments.

Hedge choice

The focus here is to introduce a way for a finance director and his treasurer to select a hedge given the nature of their institution’s appetite for risk, its performance measurement yardstick and its forecasts on rate direction.

Should the option be out-of-the-money (OTM)? An OTM US dollar call option purchased by a firm is such that it gives the buyer the right but not the obligation to buy USD against GBP at lower than the current forward rate – fewer dollars per pound. Should the option be at-the-money (ATM)? An ATM USD call option is to buy dollars at a rate exactly equal to the current forward rate. Would an in-the-money (ITM) option be advisable? An ITM USD call is such that the rate is better (higher) than the ruling forward rate and consequently results in a higher insurance premium. In extremis an option to buy dollars at GBP/USD 2.50 for a year would be a very deep ITM option. It would be almost certainly exercised. Therefore an extremely deep ITM option is an exact substitute for a forward contract that is bound to be exercised. An extremely deep OTM option is a substitute for an uncovered position or no hedge at all.

The continued publicity surrounding billion dollar losses on derivatives suggests that a firm’s appetite for risk is an important determinant of hedge choice. There is, however, disagreement on how such decisions should be judged. “Cover everything automatically in the forward market”? or “Leave everything uncovered until spot and blame losses on al-Qaeda or whatever” may be politically sensible approaches. Conventionally, option salesmen have advised corporate treasurers to buy OTM options. Why not ITM structures? Do they really cost more? Is a forward contract cost-free?

Utility or benefit function

A utility function, which could also be described as a benefit function, is a technical term used by economists. It defines what is being optimised or maximised. What is the point of the exercise? Utility theory concerns itself with defining value. How valuable different outcomes are to a decision-maker. A utility function mathematically expresses and assigns a value to all possible outcomes. In portfolio theory the utility function expresses the preferences of economic entities with respect to perceived risk and return.

Watching Bobby Robson and Terry Venables discuss Brazil's World Cup final victory over Germany I am reminded that both once coached Barcelona Football Club. What is the utility function of the coach of F.C. Barcelona? Bobby Robson, as coach in 1997 won the European Cup Winners' Cup as well as two domestic Spanish cups. He was still fired! Why? Real Madrid won the Spanish league title that year. But his successor, Louis Van Gaal, did win the league and in particular finished ahead of rival Real Madrid. But he was still vilified for not using enough Catalans and forced out. As it happens Van Gaal has just returned to Barca after failing as Holland's coach. So a poor track record is not necessarily a hindrance in football or indeed as the CEO of a billion pound losing firm. Just as in the case of individual investors in Premium Bonds or gamblers in lotteries and casinos or football team presidents, corporations do not have linear relationships between profit & loss and benefit to the firm.

A firm's benefit or utility function should be developed based on risk appetite and its performance yardstick. Monetary profits and losses should be mapped onto 'Benefit Gains and Pains'. Perhaps the benefit function should be such that the pain value of a loss of

USD200m should be three times the pain value of a loss USD100m. Moreover, the benefit function will generally not be symmetric around a nil profit/loss result. The loss of USD200m is generally much more painful for an organisation than the positive benefit of a gain of USD200m. The value of income is seldom disposable. It is with this very much in mind that a potential corporate buyer examines the benefits of options sold by banks or the value of the services and claims of the various 'dynamic hedging' exposure management firms. These firms attempt to replicate options for their clients by putting on and then adjusting forward exchange contracts. Under this dynamic hedging system the client is not, however, comforted with the strictly limited exposure generated by an option purchased.

Judgement after the fact

International surveys of corporate treasurers have suggested that the main benchmarks for foreign exchange transaction exposure are spot, forward cover and budget rate spread equally amongst companies. In many cases the application of these benchmarks is simple and relatively arbitrary. A cynical view would be that the performance measurement yardstick most often used in practice, though seldom explicitly, is based on judgement after the fact given the more favourable between the forward rate and the spot rate available at the time of exchange.

Ready-reckoner charts can be created to suggest choice of hedge given the performance measurement yardstick, risk bearing capacity, and the treasurer's spot rate out-turn views. Risk-shy managers mirror their yardsticks. They fully cover forward foreign exchange exposures if measured versus a forward cover yardstick. Risk-shy treasurers keep their loans and deposits on short-term maturities if their measurement criteria so encourage.

The risk lover behaves as though he has unlimited capital at his disposal and full autonomy. Risk managing treasurers will not adopt such extreme positions. They will lean towards OTM or ITM options subject to yardstick.

The ready-reckoner charts could provide the basis for an examination by the firm's Treasury Committee of its objectives, policies and strategies. Measurement versus spot, forward or an ATM option are but three special cases. In setting a yardstick, motivation must be balanced by discipline and control.

And finally ...

Before deciding on a performance management methodology, carefully examine your objectives. And before choosing a hedging strategy examine and analyse your performance management system. If the resulting strategy seems strange then re-examine your performance management methodology and reappraise your objectives. So if you really want to be a millionaire, study your or your firm's, probably unwritten, utility function. ♦

This article is based on chapter 9 of Key financial instruments: understanding and innovating in the world of derivatives by Warren Edwardes, published by Financial Times Prentice Hall. Copyright is retained by Pearson Education and Warren Edwardes and the text is reproduced with their permission.



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Delphi Risk Management

London-based Delphi is a training, consulting and expert witness firm in financial product innovation, engineering, communication and risk management.

Delphi offers a treasury audit service which is a practitioner-based 'health check' especially related to derivative products. It will analyse current methodology, spotlight areas to be enhanced and set up a basis for the way forward.