(ultimately government failure) renders the situation unaffordable. A government which fails to correct for the dislocation, or worse exacerbates the dislocation, renders the entire situation ultimately unaffordable. The principal problem in South Africa is not the affordability of hi-technology, but the affordability of current government policy.

In the long run, Technological Decline, or mere Technological Survival in the Siege, both the products of political choices, are unaffordable. Ultimately, a State of Siege, itself a product of political mismanagement, is unaffordable. Equally, it still needs to be shown that a Hi-Tech Onslaught is within the capabilities (or affordability) of the country. But a Hi-Tech Onslaught is preferable to a Total Onslaught.

The challenge is therefore threefold:

(i) Firstly, the social dislocation caused as countries (and organisations) progress up the technological ladder must be recognised. The trade-off between efficiency and equity must be acknowledge, especially in the South African context, with the country's unique history and current situation.

(ii) Secondly, individuals and organisations must do their best to soften the dislocating effects of technological advance. Here hi-technology can play an astounding role. In the field of education high technology can be applied with great benefit. Essentially the application of labour augmenting technology, the productivity and skills of human resources can be efficiently and effectively upgraded employing hi-technology. In this sense, technology may become a welcome saviour to South African society.

(iii) Finally, and perhaps most importantly, others must be convinced that an Effective Reform/Negotiated Settlement is the only true road to a sustainable future. This future will not be without its problems, but it stands a better chance of success than the present road. The road of confrontation, conflict and siege is likely to reap a technology South Africa can ill-afford, not to mention the other costs the society will be called upon to bear, both during the siege and for decades thereafter.

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Investment basics XXII
Options trading in the gilt-market

Part 2: Pricing and use of options

Having looked, in the last issue, at a little of the background to gilt or bond options, we now turn our attention to the pricing of options and the practical use of these instruments.

Pricing

One of the reasons given by reluctant participants for not using options is the difficulty in pricing them. However, the pricing of an option is no more 'inaccurate' than the pricing of a gilt which assumes that each half yearly coupon is re-invested at the original yield to maturity – surely rather a wild assumption on a 20 year instrument. The calculation of a fair price attempts to ensure that neither the buyer or seller of the option have an obvious financial advantage. There are two systems currently in use; Black and Scholes and the binomial system. The difference in the two systems would warrant an article of its own but the essential difference for purposes of this article is that the binomial system takes into account potential early exercise of an option and the Black and Scholes system does not. Obviously this impacts on options on interest bearing instruments like bonds where the price changes every day.

The calculation of price takes into account the following:

(i) the current market price of the underlying security
(ii) the strike price of the option
(iii) the cost of money for the period of the option; risk free rate
(iv) the time to the expiry of the option
(v) standard deviation of the price of the asset; the past trend
(vi) cumulative probability function; the future trend.

It is quite plain to see that (i)-(iv) rely on fixed information while (v) and (vi) are variable. The standard deviation of the asset will obviously vary dependent on the frequency with which movements of the asset are recorded. A daily closing rate will produce a different result from recording every trade. This will also affect the cumulative probability function which is rather a grandiose way of wondering what the price of an asset is likely to do in the future. All this contributes to what is known as the volatility of a stock and is the single most misunderstood aspect of options. Over the past six months the price of a stock may have been stable for the first five months and then may have moved erratically in the last month. Obviously the last month's behaviour is far more pertinent when trying to decide what the future is likely to hold. It will be appreciated that all voltility really does is to indicate when you are flying upside down. It was never intended to give all the answers and the important factor when buying or selling options is what the market *actually* does in the future. No computer programme will tell you that.

Even if you believe that a particular computer model gives a totally accurate picture of stock volatility, you could be in for something of a culture shock when the market trades further and further away from that volatility. Not so long ago, the price of November put options rose some 30% in half an hour. The market price of the stock had not altered and therefore all the data remained the same for both price movements. The price rise was simply caused by demand. Perceptions of the market had changed and demand for put options exceeded supply, at least for half an hour. All those puts are now showing a healthy profit and the only difference is that the early buyers paid a lower price. Strictly speaking, if everyone were governed by their computer models, the price would not have moved until the spot rate had moved, but markets being what they are, dealers decided manually to over-ride their information and take a position based on fundamentals. Price discovery does not come out of a machine. Only when an investor is prepared to pay a price for something is there any certainty as to the price. Although we all rely on increasingly sophisticated pricing systems, demand and supply are the final arbiters. What a pity that it is impossible to build market sentiment into a pricing model.

Why use options?

Successful investment managers look for opportunities to improve their return on capital. This means that they have to be active in markets to be consistently profitable. That involves taking the rough with the smooth. Obviously, nobody buys stock with the intention of losing money so it is as important to cut losses as it is to make profits. Options are a transfer of risk and like everything there is a risk/reward consideration. Bearing in mind that the pricing is based on time and probability what is actually happening when an option is sold?

The seller receives a premium but has unlimited risk. The buyer pays a premium and has unlimited profit potential. If the option expires unexercised, he forfeits his premium.

This is rather simplistic and would suggest that anyone must be mad to write options but, obviously, risk can be managed and if the writer of an option has a contrary view to the buyer, then he will be happy to receive a premium for an option he never believes will be exercised.

Call options

If long term interest rates are expected to fall, investors go long of gilts hoping for capital gains. An alternative would be to buy call options. Compare the two decisions.

1. Assume you purchase R1 million nominal of Eskom L168 at 16,75% YTM for settlement on 2nd June 1988. The price paid would have been R670 767. The benefits are that interest will be accrued daily and, provided short-term interest rates do not rise sharply, it will be possible to borrow short-term money to invest in long-term gilts and enjoy the extra benefit of running yield while that happy situation continues. If interest rates fall, you will make a capital gain of some R400 per 0,01% move. The downside to all this is that if long rates rise you will make a capital loss and if short-term rates rise you will lose running yield. In other words, the investment will be giving a negative return.

Instead of buying in the physical market, you can buy a 17% call option maturing on August 4th for R11 500. Were the spot rate to be 16,75% so the price of the option reflected 25 points (0,25%) of intrinsic value, the amount would be about R10 000; the balance of R1 500 paying for the time value. You can own that option for two months unless you decide to sell it, and therefore you have that amount of time on hand for rates to fall. If rates do fall after you purchased the option, the price of this *in-the-money* call will rise by at least the intrinsic value. So the capital gain is the *same* as owning the physical. There is no accrued interest benefit or running yield however. If rates rise, the price of the option will fall by at least the intrinsic value with the maximum loss being the original premium of R11 500. As can be appreciated, were rates to rise substantially, you could take a far greater loss on the physical than on the option. This can be further illustrated by assuming that by 7th

July rates have risen to 16,95% on E168. The potential loss on the physical position would be roughly R8 000 with the prospect that rates might still rise. There is also the problem of selling stock into a weak market. That in itself will push the rates up and the price down. By contrast the option is still worth about R5 000 assuming the same risk free rate and volatility. It has 5 points of intrinsic value and still a month to run. It is probably a lot more comfortable to sit with that option for the next month, than to be long of the stock.

Put options

Much the same philosophy applies to puts as to calls. If rates are perceived to be rising, what can the portfolio manager do? He can short the stock, meaning he can sell what he does not own. To do this he has to borrow it every settlement day and pay whatever short-term money cost that may apply. It is not always easy to borrow stock and there is the added possibility that he may be caught in a bear squeeze, that is, unable to buy the stock to cover his short position. He also has none of the benefits of being long, like running yield and accrued interest. His alternative is to buy put options and, when rates rise, to buy the stock in the physical market against his puts. As with calls, he has time on his side and can trade the physical against an in-the-money put, thereby giving himself greater flexibility.

These two examples amply illustrate that options can be successfully used as an alternative to the physical market. However, we have only considered the situation from the point of view of the buyer. What benefit does the seller get? Obviously he receives a premium which, if he is long of stock, enhances his book value. If he writes a naked option, in other words he has no stock to deliver against that option, he runs the risk that he will have to cover his obligations by buying in. Although the writer would appear to have the greater risk, it is all a matter of interest rate view and, obviously, someone has to be right. However, options are usually run as part of a complex strategy in a moving market with the aim of balancing positions and guarding against large potential losses.

Out-of-the-money options

The previous examples use in-the-money options. Another alternative is to consider out-of-money options. Here, you will not pay for intrinsic value, only for time value. In the case of a call, you buy the option at a strike rate below current market rates. In other words, you are taking a view that the rate will fall sufficiently to:

(i) recover the premium, and
(ii) show a profit.

In the case of the put, obviously the opposite applies and you hope that rates will rise above the strike rate to cover the premium payment and show a profit. Too many investors do not use options to trade but look only at the likelihood of the stock reaching its strike by maturity. With options trading, your view only has to be *partly* correct.

For example: in mid-April, the price for a 17,5% November put option on E168 was R2 300. In terms of volatility this look cheap but it was not easy to sell such options. The spot rate was 16,37% at the time and the most common response was that clients did not see rates going to 17,5% by November. Those clients were missing the whole point of this deal. The rates did *not* need to go to that level as long as they rose in the near future, thus pushing up the price of that particular put option. Quite simply, the sooner and the further rates rose, the more the option would have been worth. In fact, rates did rise and towards the end of April touched 16,86%. At that time, the bid for 17,5% November puts was R6 200, producing a very handsome return for the initial investor.

Every day, similar opportunities present themselves and there is a very definite swing towards trading options, not just as a hedge but as a profit generator.

Options as insurance

Having looked at options as an alternative to a physical position, what about hedging? No one knows what the future holds and the days are passing when an investment manager just takes a position and hopes he's right. It is prudent to "lock in" potential loss by buying and selling options. If, for instance, your view is that rates will fall within two months, you could buy the physical and buy puts for at least part of that portfolio. If you are correct and rates fall, you will make capital gains on your position but you will lose the premium paid on the put options because they will not be exercised. If rates rise, you will be exercising puts by selling at least part of your holding. While there is a loss, it will probably be quantifiable with options (the option premium plus the rate differential). That is a decision that the investment manager must make and he will obviously decide how much "insurance" he needs, just as he will decide how bullish he is and buy stock accordingly.

The possibilities for options trading are limited only by imagination. In a quite market it is often better to write options and receive premium. In a volatile market, it is profitable to both by and sell options. While options strategies enjoy some exotic names like butterflies, strangles and straddles and while you will inevitably hear of gammas, thetas and delta neutrality, options are largely a matter of simple mathematics and common sense.