TenStep Supplemental Paper

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Exotic Options - An Overview

In recent years, financial engineers have created a variety of complex options, collectively known as exotic options. The payoffs on these options are considerably more diverse than the payoffs on straightforward options.

Most exotic options exhibit path dependence - the price of the option today depends on the previous or the future price path followed by the underlying stock. For instance, the price of a look back call option depends on the minimum price reached by the underlying stock in the past.

Major types of exotic options

Barrier Options. A barrier option, also known as a trigger or a knock-in/knock-out option, is an option that serves as conditional insurance. Although the investor pays a premium for such an instrument at the inception of the contract, the option would come into existence (or cease to exist) only if a pre-specified barrier or level is triggered during the life of the option. There are a number of barrier options that are regularly traded on the over-the-counter market. These options are usually less expensive than the ordinary ones.

Barrier options are classified as:

- **In-Barrier.** These enable the buyer to pay a premium up-front. He/she receives an option that will not begin to operate until the price of the underlying asset reaches the barrier. The barrier may be greater or less than the exercise price. However, once the barrier is breached, the option behaves as an ordinary European call option.
- **Out Barrier.** These are generally less expensive than plain vanilla options since barriers decrease the likelihood of them being exercised.

Asian Options. Asian or Average Options are another of the many exotic options available in the market. Exotic options are derivative securities that in some way deviate from the standard American or European call and put option contracts. The Asian option has become one of the most popular exotic options in the OTC market since its first appearance in the 1980s. The term "Asian" comes from the fact that the Bankers Trust was the first to offer these products from their Tokyo office. The maturity tends to be around 1-2 years. However, they can sometimes have maturities of as long as 3 years. There are two main types of Asian options available. Of these, average rate (or price) options are more popular in terms of volume of trade.

- **Average rate (or price) option.** These options offer payoffs at maturity equal to the difference between the average of the prices recorded and a pre-specified strike price.
- **Average strike option.** These options offer payoffs at maturity equal to the difference between the value of the underlying product at the expiration date and the average of the prices recorded.

The popularity of Asian options arises from the fact that the use of an averaging process on the underlying stock greatly reduces the sensitivity of a contract to changes in the underlying stock price. This is especially important in markets that are not liquid, such as the commodities market.

Look-Back Options. Look-back options are path-dependent options where the payoff is a function of the highest or lowest price at which the underlying asset trades during the lifetime of the option. The underlying asset may be a spot asset, a forward or a future contract, a commodity, an interest rate or an index. They are negotiated either in organized markets or in OTC markets, and may be included in some contracts issued by financial institutions and firms. Standard look-back options are also known as 'no regret options.' Investors can always wait until the end of the option and then look back and decide on the most favorable underlying rate.

Benefits. Benefits pay the largest in-the-money amount over the life of the option. The look-back call owner can buy at the lowest observed price or rate. The look-back put owner can sell at the highest observed price or rate. A look-back option can never be out-of-the money. The option holder gains economic value through hindsight. The main features of the option are:

- The look-back and standard call option prices converge as the underlying price increases.
- A look-back option is more expensive than a standard option.
- An in-the-money look-back approaches the value of the standard option.

Ladder Options. Barrier options can be combined with each other or other options to create various types of options. One such package is called the ladder option, which is similar to the look-back option. These options enable the buyer to look back on the path traveled by the underlying stock. However, unlike look-back options, the ladders have payoffs that 'lock in' at some preset levels. Therefore, the ladder option is just a variation of the look-back option (apart from the fact that the look-back mechanism is effective only for a set of predetermined levels achieved by the underlying asset).

Applications. The applications of ladder options are quite similar to those of the look-back. Thus, investors will never regret the fact that they had not traded before the underlying asset rate had risen from a low or had fallen from a peak. The only difference is that at expiration, the investor cannot look back at a continuous range of rates, but discretely opts for rates, when choosing the strike rate. Modified ladder options have a strike that is fixed. The payoff doesn't depend as much on the final underlying rate as it does in the case of the standard ladder option. This may prompt some investors to prefer modified look-back options.