4 Basic Options Structures, Pay-Out Profiles, and Usage

This Chapter provides a primarily qualitative description of options structures in terms of the contracted option pay-out formula, and the implied "pay-out profile". These profiles are then used to provide risk-adjusted explanation of a variety of uses for standard and advanced options, as well as the essentials of structuring options.

> Aside: Pay-out profiles are one of the most important tools for derivatives, and especially options/structured products. They provide one of the most important insights into the risk/return profile generated by derivatives, and thus one of the most important methods for assessing the appropriateness of the risk/return profile of a structure vis-à-vis your or your clients risk/return profile/requirements.

This Chapter relies primarily on the expiration or delivery date pay-out profiles in considering economic need and usage of options. A complete pay-out profile/surface encompasses the entire holding period including delivery/expiration. However, much technical material is required to extend to an encompassing discussion extending beyond the delivery/expiration date, and which would dilute the most important risk/return aspects of this "usage" story required for an introduction. The detailed technical/comprehensive explanations begin with Chapter 7.

This Chapter also starts the transition to using primarily "net" pay-out formulas and profiles, as opposed to the formula specified in the contract. That is, the contract usually stipulates what is delivered. However, the net value of the option itself is the pay-out/deliverable, less any costs (direct or indirect) that are incurred on the way to the delivery date, such as the option's premium etc.

> Caveat: this Chapter is concerned primarily with "static position's" pay-out on delivery/expiration. The complete picture requires the inclusion of all the events prior to delivery, and generally must also be considered in the context of a dynamic environment.

4.1 Non-Contingent Derivatives: Futures, Forwards, and (most) Underlyings

All non-contingent derivatives and most contracts underlying options[17] have "linear" pay-out profiles. To see this, just consider that for every dollar change in the price of your (linear) investment increases the value of your position by one dollar per "contract[18]". That is, there is a one-to-one correspondence between the price of the instrument and the value of the position. Obviously, then, for every dollar the price drops, the position value or P&L decreases by one dollar per "contract".

Figure 4.1 – 1 a) and b) illustrate one possible price history arriving at one possible price for an instrument, and which then implies a particular one-to-one impact on the position value/P&L on particular date in the future. The second image shows the position value(s) for a continuum of possible prices on that future date.

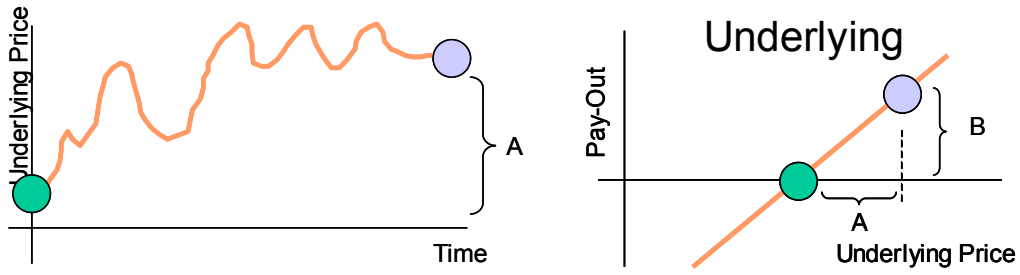

Figure 4.1 – 1. The chart on the left is a price history, while the chart on the right is the net gain or loss on the position as of a specific date in the future, but forms a continuum of possible prices on the future date in relation to the inception date price.

The "pay-out" of the position is the "position value" or Profit & Loss (P&L), and that pay-out profile for many possible future prices is a straight-line, or "linear".

If the market price ends up increasing by an amount A, then the P&L is B. If it's a "single contract" than A = B (i.e. a slope of 1). In general, B = N*A, where N is the number of contracts or equivalent. Thus, if the price increases 1 dollar, and you own 10 shares, then your P&L = 10*1 = 10.

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[17] It is "most" underlying contracts, since some options actually have other options as their underlying contract. These types of options on options are most commonly associated with the so-called Compound Options, see Section 4.10, Chapter 16, and the TG2 Exotic and Hybrid Products books [9] and [10].

[18] Here, the term "contract" may mean an actual contract that is denominated in pre-defined terms, and also contracts such as those in OTC market where the "notional" value of the contract determines its "defined size"

Aside: It may help to think of the pay-out profile as "rotated end view" of the price history (e.g. looking form the "right edge in".

In reality, even "proper" linear products may have a small degree of curvature due to funding and other issues, but for the most part it is reasonable to refer to these as "linear". These and other deeper technical matters are lest for latter chapters.

4.2 Puts, Calls, and Put-Call Parity

Aside: In a sense, the entire purpose of options and contingent derivatives is to create a "non-linear" or "asymmetric" pay-out profile to permit tailored solutions to specific risk/return profiles required by hedgers, investors, etc.

The most common basic options structures are the Call and Put options. The Call option gives the owner of the option the right (but not the obligation) to "call on the seller" and purchase the underlying at the Strike price (K). Assuming a rational market place[19], the option owner will not call on the seller until the market price (P) exceeds the Strike price (K), leading to the usual Call Option pay-out valuation formula of:

$$Call = Max\left[P - K, 0\right] \tag{4.1}$$

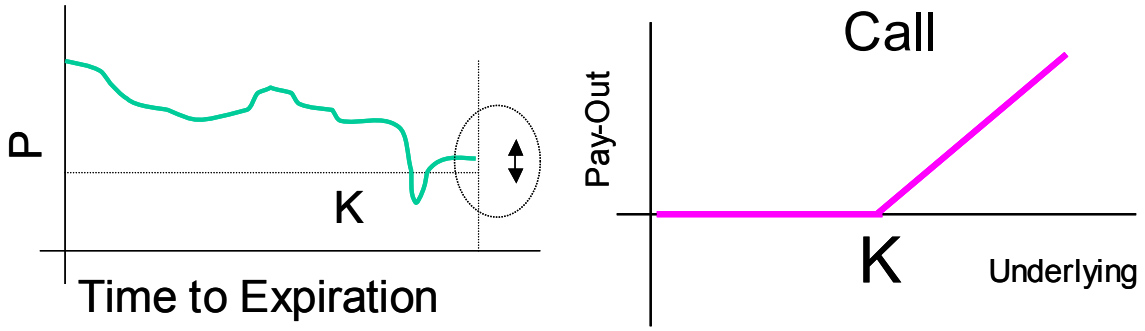

Figure 4.2 – 1. The image on the left shows one possible evolution or path of prices, and illustrates the options pay-out in relation to the Call Strike price K, for this path. The image on the right shows the Call options "total" pay-out "looking at the price history from the end, and rotated", but for all the possible paths arriving at the delivery date (as opposes the just the single path on the left).

Notice the asymmetry. A Call option makes money when the market/underlying rises above the strike price. Thus, a call is useful when expecting rallying markets/prices.

[19] In reality, the "rational market place hypotheses" breaks down from time to time, or at least requires modification for additional factors. This is seen with various products, such as pre-payment feature in mortgages, when mortgage owners do not refinance as interest rates fall below their mortgage rate. There are many other examples, which will be introduced as appropriate.