# Crossing Barriers

## Equities for externs and interns

**June, 2010**


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# Executive Summary

# Crossing Barriers: Equities for externs and interns

**This note is primarily geared towards investors from other asset classes; it also serves as a reference for equity experts.**

For an investor to "cross the barrier" from their asset class to another, they need to feel comfortable in doing so. Getting the basics right and understanding the products is absolutely crucial. In this publication we give investors from all asset classes the relevant and necessary details of equity instruments and try to build a bridge to equities.

- We start with a very general introduction to equity and its origins, as well as a brief outline of its history, the markets and valuation techniques.
- The subsequent chapter outlines Credit Suisse's proprietary HOLT® investment tool.
- In the next chapter, we look at equity derivatives through an explanation of the basics, a translation of the jargon and a look into some of the more common strategies.
- The next section looks at a true cross-asset instrument – the convertible bond. A convertible is in essence a corporate bond with an embedded equity warrant.
- Then we look at Delta One (ETFs, Swaps & Futures).
- Finally, we provide a brief explanation of the electronic trading of equities.

*We note that the Fixed Income Credit Research team published a primer on credit that can be viewed as supplementary to this report.*

# Contents

# Equity

**What is Equity?**

A company primarily generates capital via two main sources - Credit (Bond issues, loans, notes payable and commercial paper) and Equity (Common shares, preferred shares and warrants).

Equities are a stake in the ownership of a company. It represents a claim on the company's assets and earnings once all prior obligations, liabilities and debts have been satisfied.

This means that a shareholder has a residual interest in the company i.e. if a company is liquidated, a common shareholder will receive their money only after secured and unsecured creditors (including employees and the tax collector!) and preferred shareholders are paid off. This makes equities riskier than debt or preferred shares. Equities are therefore expected to outperform credit in the long-run due to the inviolate risk-reward maxim.

**History of Equity**

The idea of ‘shared ownership’ of an enterprise is probably as old as mankind itself, but the Romans are widely credited with the formalisation of what we now call ‘shares’ along with a system of Jurisprudence that is the foundation for much of today’s commercial law. The Roman Empire used quasi-PFI private providers called publicani. Shares in publicani were called "socii" (for large co-operatives) or "particulae" (for smaller concerns).

After the middle ages, the pooling of capital was used to finance the building of large-scale capital projects such as merchant ships, warehouses and infrastructure. Prior to this, such projects could only be undertaken only by governments, the aristocracy, the Church or the very wealthiest of individuals.

The founding of the Dutch East India Company in 1606 is one example of the sort of international trading concerns that were created by the issuing and trading of public capital. What is more, the Dutch stock market of the 1600s provides evidence of the trading of shares, futures and options, the use of credit to purchase shares, the use of short selling of those shares and the creation (and spectacular ending) of speculative bubbles.

A shareholder is therefore any individual or company that legally has claim to the assets / liabilities and profits / losses of an enterprise. Shareholders have different rights / obligations depending upon the type of ownership (voting, dividends, proceeds upon liquidation), but shareholders are always subordinate to the creditors.

**Types of equity**

- Common shares: A security that represents ownership in the company. Common share holders can exercise voting rights and hence participate to a greater extent in the fortunes of the firm.

**Figure 1: Share certificate**


*Source: Credit Suisse*

Shares were traditionally represented by share certificates. The majority of share holdings are now electronic.

- Preferred shares: Preferred shares are shares in a company which have a defined dividend, and a prior claim on income to the common share holder and hence is seen as a (relatively) more secure investment.
- Warrants: A derivative security issued by the company which gives the holder the right to purchase shares of that company at a specified price.

**Equity Markets**

- Primary Market: A market for new issues of securities. The issuing company or corporation receives cash proceeds from the sale of shares, often called the Initial Private Offering (IPO). This may be used to generate funds that are invested in on-going operations and expand the business, or to provide capital for a new venture.
- Secondary Market: Once the initial sale is complete, further trading is conducted on the secondary market. This is normally the main source of liquidity in the shares.

**Price of Equities**

- Par / Face value: This is the nominal value of the security as stated by the issuer. It represents the financial liability of the holder of the share i.e. the shareholder in a limited liability company can only lose the value of the shares and cannot be held liable by creditors of the company for any other claims.
- Market value of shares: The current price at which the share is trading. Market value is often different from book value of a share as it takes future earnings growth potential into account.

**Figure 2: A typical Bloomberg screen shot for an equity security**


*Source: Bloomberg*

### Returns from Equity Investments

Returns form equity investments include dividends and capital appreciation / depreciation.

- Dividends: A portion of company's earnings distributed to its shareholders. Such distributions normally occur on an annual or semi-annual basis. They are subject to accounting rules and usually require approval by the shareholders at the Annual General Meeting.
- Capital appreciation / depreciation: A rise / fall in the market price of the share from the time it is purchased until the time that it is sold / valued / marked-to-market.

### Valuation of Equities

Fundamental valuation is the process of determining how much a company or its share capital is worth. The economist Keynes (in chapter 12 of his The General Theory) stated that it was not a prediction of value but a convention that facilitated investment and enables liquidity despite the fact that the underlying assets were illiquid.

There are a numerous techniques – both objective and subjective - that can be used to determine value. A share is said to be cheap if the market value is less than the 'fair' value thus determined and therefore provides a rational investor the potential to maximize the returns available.

The market itself sets the price for a particular share as the result of simple supply and demand, with the share price set at the point of equilibrium.

There are two main theories on the behaviour of markets – the Efficient Market Hypothesis and Behavioural Finance.

The Efficient Market Hypothesis states that at any given moment the price of an asset represents a rational evaluation of all the known information about that asset (essentially, that the price is the result of a discounted cash flow calculation).

This is seen as problematic because:

(i) It assumes that all investors perceive all of the available information in the same way (unrealistic given the myriad of valuation techniques);

(ii) The inference is that no single investor would be able to generate greater returns than any other (not born out by the empirical evidence);

(iii) Similarly no investor should be able to 'beat the market' and would therefore be better putting capital into an index fund (presumably not something that Warren Buffett would agree with?).

As a result, there have been attempts to qualify or explain the Efficient Market Hypothesis, instead maintaining that the market is always efficient in the long-run, but that it takes time for the market to respond to new information.

Behavioural Finance states instead that individuals make irrational decisions based upon fears and misconceptions about potential outcomes (essentially a fear and greed premise). It is the combination of psychology and economics that investigates what happens in markets in which some of the agents display human limitations and complications. It places an emphasis upon investor behaviour leading to various market anomalies.

*Behavioural finance argues that some financial phenomena can plausibly be understood using models in which some agents are not fully rational. The field has two building blocks: limits to arbitrage, which argues that it can be difficult for rational traders to undo the dislocations caused by less rational traders; and psychology, which catalogues the kinds of deviations from full rationality we might expect to see. We discuss these two topics, and then present a number of behavioural finance applications: to the aggregate stock market, to the cross-section of average returns, to individual trading behaviour, and to corporate finance. We close by assessing progress in the field and speculating about its future course.* Barberis and Thaler (2001).

**DCF (Discounted cash flow):** is the derivation of a fundamental value of a company and its shares by estimating the present value of all projected future cash flows (taking account of future investment requirements and the returns earned on invested capital over the life of the company). These cash flows are discounted over a forecast time horizon together with a discount of a terminal value to provide a present value. The discount rate is 'the weighted average cost of capital' of the company - a reflection of its cost of equity and cost of debt. The cost of equity is the risk free rate of debt plus an assumed 'equity risk premium'. A DCF valuation is dependent upon wide range of assumptions. It is most often used for companies with stable and visible long-term cash flows.

A firm's Weighted Average Cost of Capital (WACC) is given by:

WACC = (%Equity)*(Cost of Equity) + (%Debt)*(After-tax Cost of Debt), where the after-tax cost of debt = (1-tax rate) * (cost of debt)

The cost of equity is the return demanded by equity holders and usually is calculated using the Capital Asset Pricing Model (CAPM).

The cost of debt ($K_d$) is the current cost of debt (that the enterprise would incur if raising debt capital now) and not the coupon on historic bonds / bank lending.

**The cost of equity:** the cost of equity ($K_e$) is the cost of equity capital to the company from the perspective of the investor. It is the rate of return required to compensate them for the risk of providing the company with equity capital.

Unlike the cost of debt, the $K_e$ is not directly observable. There are various ways to estimate the $K_e$.

Under the Capital Asset Pricing Model (CAPM), the $K_e$ = rF+ ß(rM-rF), where rF is the risk-free rate, rM is the expected (or required) return of the market, ß is the company's beta and (rM-rF) is the equity risk premium (see below).

There are also methods based on option pricing and the company's cost of debt (N.B. the $K_e$ must exceed the $K_d$).

**Relative valuations:** this methodology is based upon the premise that similar assets sell at similar prices and assumes that a ratio comparing value to some company-specific variable (operating profit, cash flow, dividends, earnings, etc.) is the same across similar companies. Hence value of a company can be arrived at by comparing appropriate multiples of a company with its peer group. The most commonly used multiples are: Price/Earnings (P/E); Enterprise Value / Earnings before Interest, Tax, Depreciation and Amortisation (EV/EBITDA); Dividend Yield; Free Cash Flow (FCF) yield; Price / Book Value (P/B); Price or Enterprise Value / Cash Flow; Price or Enterprise Value / Sales.

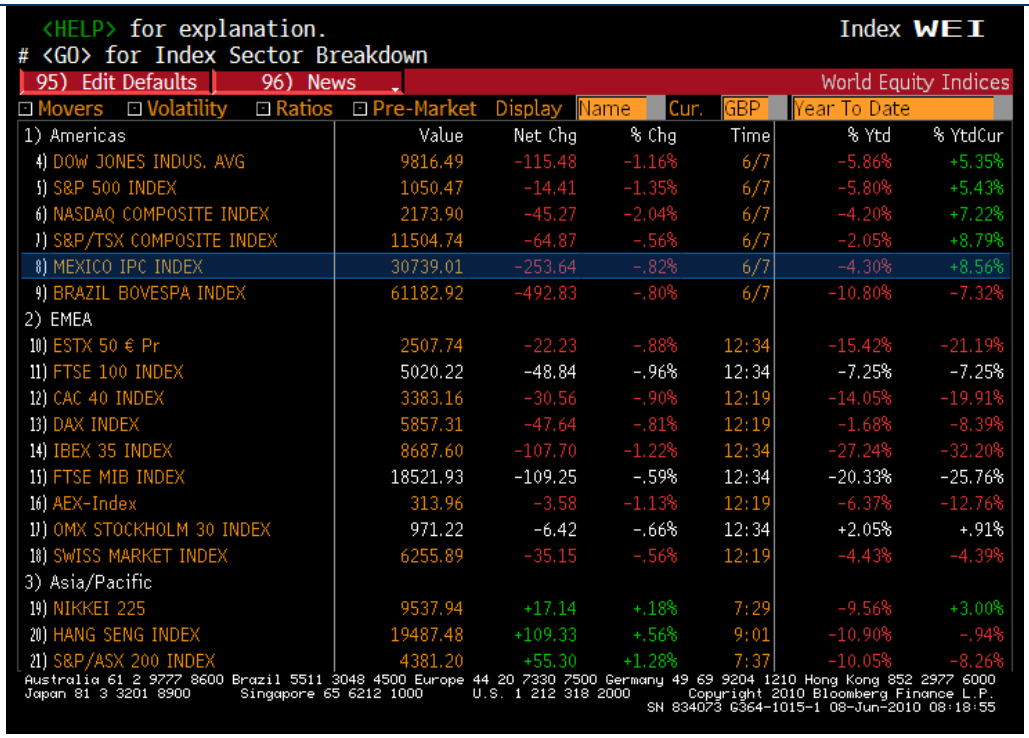
- **Earnings based ratios i.e. P/E:** These ratios indicate how much investors are willing to pay per unit of earnings. A high P/E tends to suggests that investors are expecting higher earnings growth in the future for which they are prepared to pay a premium, or a higher quality / higher sustainability / lower volatility of those earnings.
- **Book value based ratios i.e. P/B:** These ratios are used to compare a company's market value to its accounting book value. The ratio shows how much investors would be prepared to pay with reference to a quasi-liquidation value for the enterprise. Investors often use this benchmark to differentiate between the returns different companies generate from their assets. A high ratio can denote a company with higher relative returns. The ratio is often used in assessing the merits of financial, utility and property based companies.
- **Dividend based ratios i.e. Dividend Yield and Gordon's Growth Model:** This is a way to measure how much cash flow accrues to investors. This is a methodology that is often used by income investors - particularly retail investors. However, a company reflecting a very high yield as measure by its historic dividend may be a reflection of the unsustainable level of this dividend in the future.

- **Cashflow based ratios i.e. FCF yield:** Free cash flow (which takes into account capital expenditure and other on-going costs a business incurs to maintain the operating business) is considered a good representation of the returns stakeholders receive from owning a business. The lower the ratio, the lower the cash generated per share by the company relative to it share price and can indicate a company that is investing heavily or in a start-up phase A high free cash flow yield may be a feature that attracts a potential takeover from another company.

### Equity Indices

An equity index is an aggregate value produced by combining several shares and expressing their values against a base value at a specific date (i.e. FTSE 100 pr the Dow Jones Industrial Average). An index typically represents an entire stock market, a geography or sector.

**Figure 3: A Bloomberg screen shot for the main global equity indices**




*Source: Bloomberg*

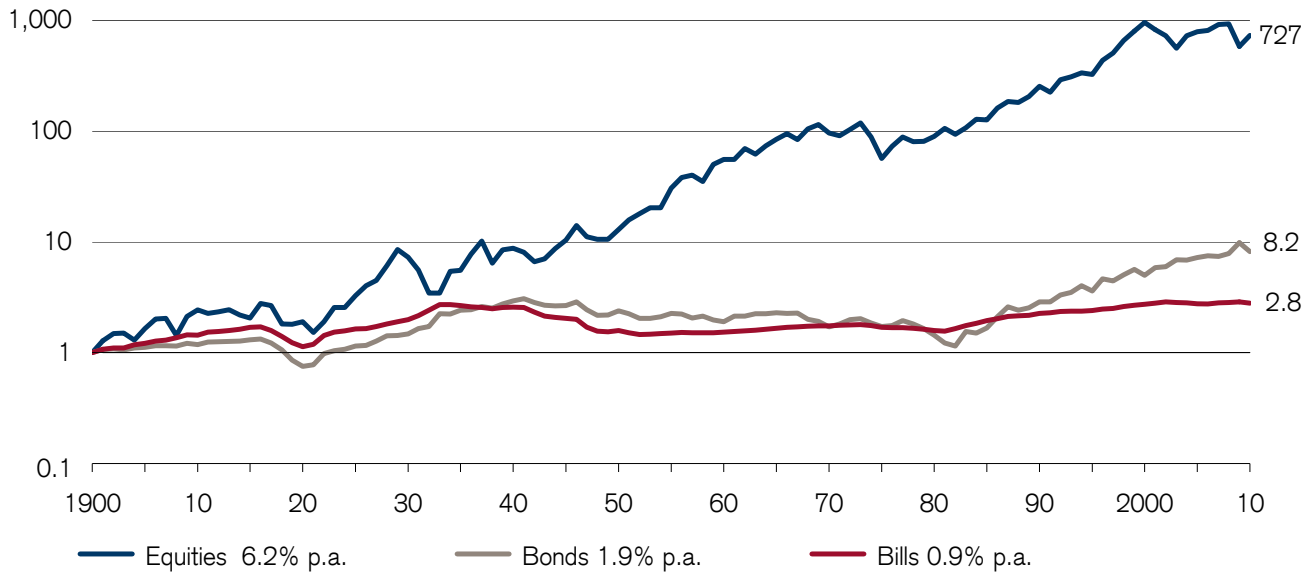
The largest equity market by far is the US stock market reflecting equity market capitalization of around $14 trillion. According to the Credit Suisse Global Investment Returns Yearbook, at the end of 2009 the US represented 41% of the total global. The UK (8.7%) and Japan (7.9%) complete the top three by country.

### Long-Term Equity Returns

The inherent volatility of equities means a long term analysis of their returns is required to provide any guidance. This can be a function of decades not weeks or years. The returns on equities in the first decade of the 21st century were negative whilst in the 1990s substantially positive in most markets.

According to the Credit Suisse Global Investment Returns Yearbook, the long term total return on US equities as measured since 1900 was 6.2% in real terms or 9.3% in nominal terms, taking account of the reinvestment of the dividends paid by a company. Over the same period, the total returns on bonds were 1.9% in real terms and 5% in nominal terms and the total return on bills (i.e. cash) of 0.9% and 3.9% respectively. This illustrates that over the very long term, equities have generated an excess return over bonds that have in turn generated excess return over bills.

**Figure 4: Comparing Real Returns for US Equities and Credit since 1900**




*Source: Dimson, Marsh and Staunton (Credit Suisse) and Triumph of the Optimists, Princeton University, 2002*

**Equity Risk Premium**

The equity risk premium is the incremental return that investors require from holding risky equities relative to risk free securities. The equity risk premium can vary considerably depending on the time period measured, hence a long time series is required to judge its appropriate level. Since 1900, the geometric US equity risk premium relative to bonds has been 4.2% and relative to bills 5.2%.

# Credit Suisse HOLT®

HOLT Is a proprietary investment methodology to Credit Suisse. HOLT's unique methodology converts noisy accounting data into CFROI. HOLT removes accounting and inflation differences globally to allow for comparisons across sectors and geographic borders. Valuations are based on projected cash flows discounted to present value. HOLT's proprietary CFROI® framework includes over 20,000 companies in more than 60 countries. Over 30 years of continuous development and dedicated accounting, sector, and quantitative experts ensure a rigorous approach.

**HOLT explained**

**The Market Values Firms On Expected Cash Flows**

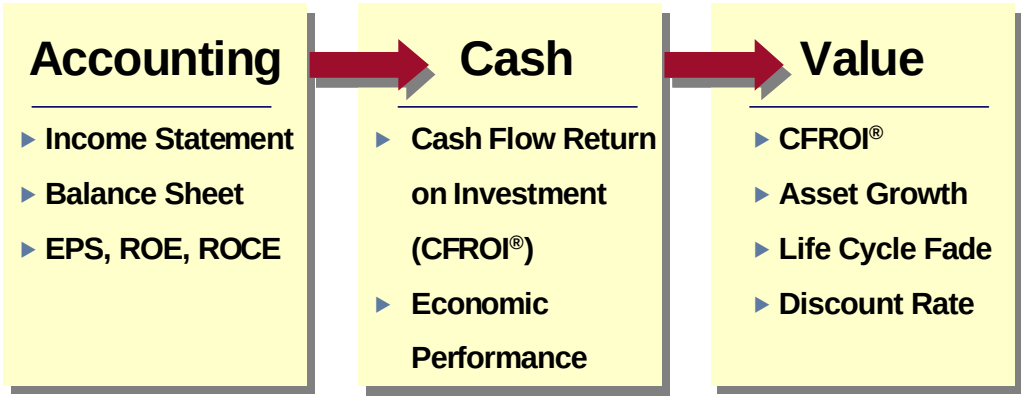
Accounting data misrepresents the underlying economics of business activities due to the distortions found in traditional accounting measures of performance. Therefore, cash flows generated from true economic activities, which can be measured by Cash Flow Return on Investment (CFROI®), are a superior measure of economic performance. A key premise of our model is that a firm's warranted value is ultimately determined by its creation or destruction of wealth from these economic activities.

Having uncovered a number of accounting distortions over time (the effort continues), Credit Suisse HOLT converts reported income statement and balance sheet information into a cash-based measure of performance more closely approximating the underlying economics of the business. With these improvements, we can more effectively estimate a firm's value from levels of and changes in CFROIs and life-cycle patterns, operating assets, reinvestment rates and discount rates.

Sample accounting issues for which we make adjustments include: inflation, financing and capital structure decisions (including financial subsidiaries and operating leases), depreciation methods, treatment of non-operating investments, revaluation of assets, write-downs/write-offs, R&D capitalization, special items, inventory valuation methods, acquisition goodwill, fair-value mark-up to acquired plant, pensions, special reserves, stock compensation expense, and regional- and industry-specific conventions.

Our adjustments improve performance comparisons important to valuation and investment decision making by providing comparability across time, among companies (peers) and across international borders.

**Figure 5: HOLT general methodology**



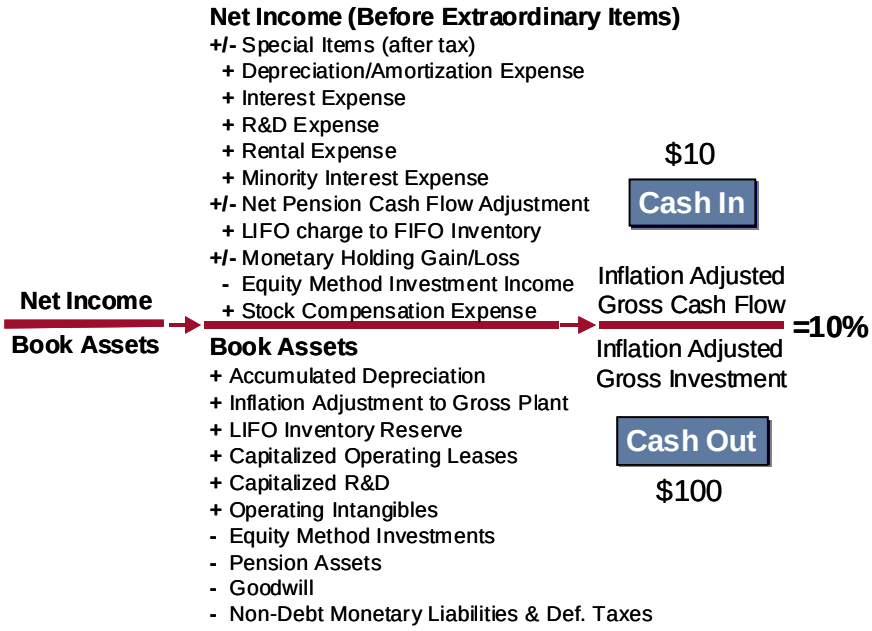

*Source: Credit Suisse HOLT*

**CFROI® as a Proxy For Economic Return**

For capital budgeting purposes, the economic profile of a project is specified as the forecasted amounts and timing of all cash outflows and inflows over the estimated project life. An internal rate of return (IRR) can then be calculated and interpreted as the project's ROI. If all cash flow amounts are stated in monetary units of equal purchasing power across time, the project ROI is a real ROI.

Simply stated, Credit Suisse HOLT's CFROI® (Cash Flow Return On Investment) is an estimated real ROI. And just as a single-project ROI is taken as a proxy for its economic return, the CFROI approximates the average real ROIs being achieved on the firm's ongoing projects by converting the income statement and balance sheet into a CFROI, which can then be used as a proxy for the firm's economic return.

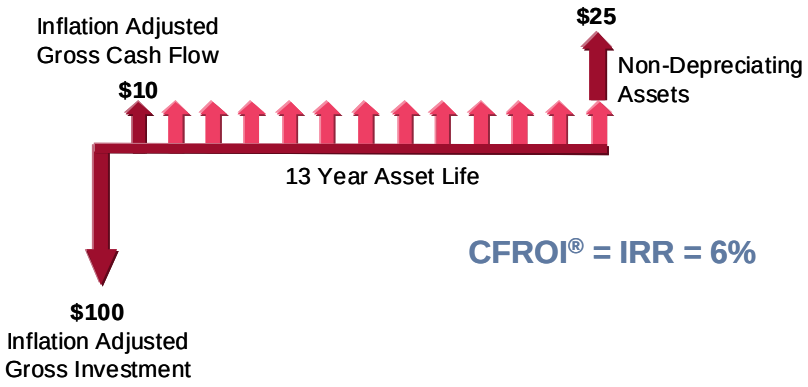
**Figure 6: Accounting for cash**




*Source: Credit Suisse HOLT*

CFROI is calculated in two steps: First, the inflation-adjusted gross cash flows available to all capital owners are measured and compared to the inflation-adjusted gross investment made by the capital owners. This ratio is then translated into an IRR by recognizing the finite economic life of depreciating assets and the residual value of non-depreciating assets, such as land and working capital. As a percent-per-year IRR, this CFROI approximates the economic return produced by the firm's projects and can be directly compared against the return investors demand (i.e., the firm's discount rate, or cost of capital) in order to gauge if the firm is creating or destroying economic wealth.

**Figure 7: Cash to CFROI**




*Source: Credit Suisse HOLT*

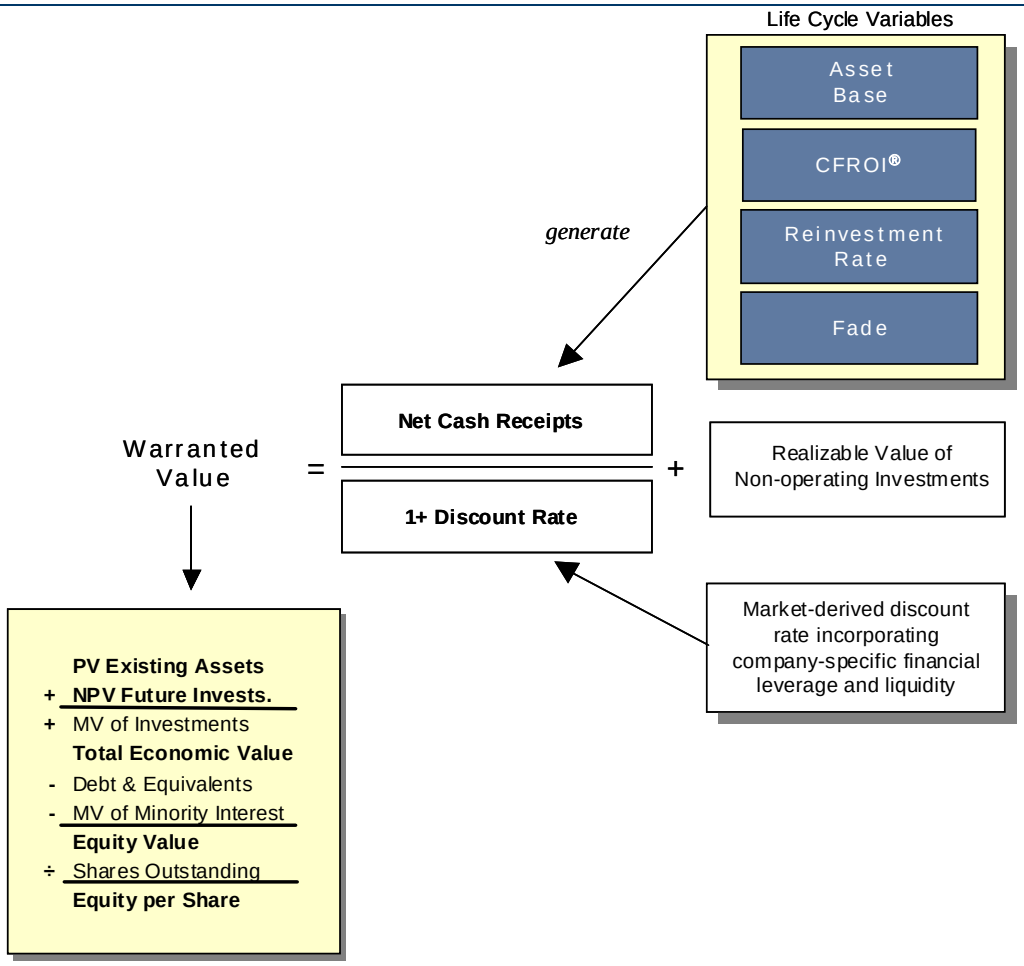
### The HOLT Valuation model

The Credit Suisse HOLT valuation model, at its foundation, is a type of DCF (discounted cash flow) model. Among our model's distinguishing features, along with the CFROI metric, is the way by which the forecasted stream of net cash receipts (NCRs) are generated and the method by which the firm's discount rate (DR) is estimated.

From a beginning asset base, the forecasted NCR stream is derived from inputs that actually generate cash flows – namely, economic returns (CFROIs), reinvestment rates (growth), and their expected patterns of change over time due to competition (fade). The competitive life-cycle is covered on the next page.

The discount rate is the rate of return investors demand for making their funds available to the firm. Consistent with CFROIs, DRs used in our model are real rates, not nominal rates. Also, consistent with our model, base DRs are mathematically derived from known market values and from NCR streams. Adjustments (positive or negative) to the base rate are made for company-specific leverage and liquidity characteristics.

**Figure 8: HOLT CFROI Valuation**



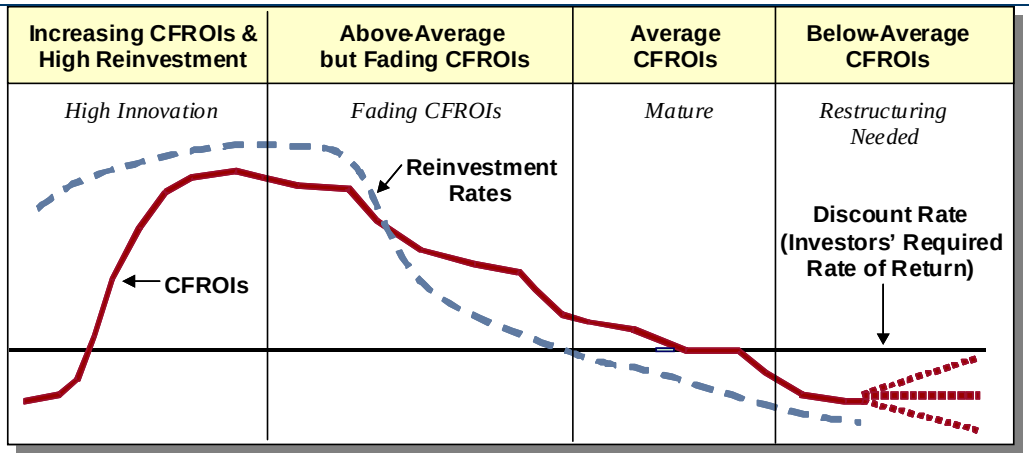

*Source: Credit Suisse HOLT*

### Firm's Competitive Life-Cycle

A widely accepted economic proposition is that competition over time drives the rate of return on capital toward equality in all industries. This can be re-stated as: competition operates to diminish the spread, positive or negative, between a firm's economic return and its cost of capital.

This life-cycle framework is an economically sound and practicable basis for forecasting baseline long-term patterns of change in economic returns (CFROIs) and growth (reinvestment rates), which in turn generate the path of a firm's forecasted NCR stream. It is incorporated in our model for forecasting baseline NCRs.

**Figure 9: Industrial Lifecycle**




*Source: Credit Suisse HOLT*

Note that "fade" is upward in the early, high-innovation phase of the life-cycle. At this time, promising innovators almost always require external financing in order to ramp up operations, and their NCRs are negative. An early-stage innovative firm can have a substantial market value representing the present value of the full stream of anticipated NCRs, including large, positive NCRs later in its life-cycle. At any stage of the life-cycle, management should take actions that will lead to wealth maximization. Wealth is measured as the present value of future NCRs, which are generated by the future life-cycle patterns of CFROIs and reinvestment rates.

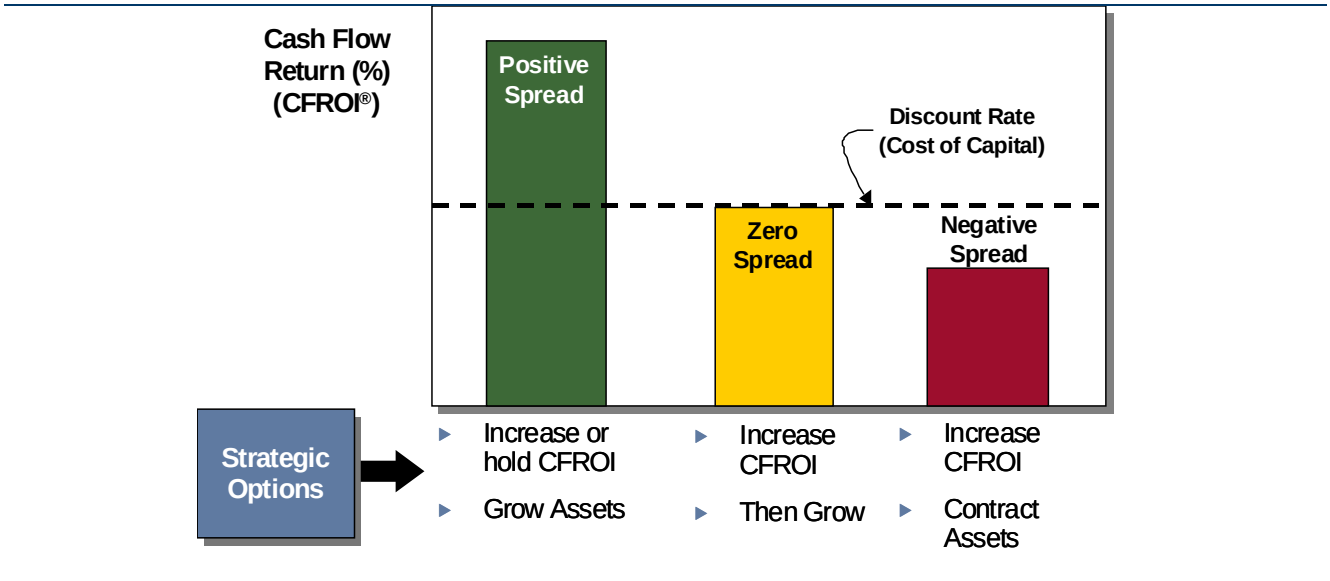
The fundamental task for portfolio managers and security analysts is to compare market expectations of future life-cycle performance (CFROIs and reinvestment rates) with their best estimates of the firms' future corporate performance. Critical to this analysis are the historical life cycles for the firm and its competitors. Credit Suisse HOLT's Relative Wealth Charts display these historical life cycles, including forecasts based on consensus estimates and implied market expectations so that plausibility judgments are much improved.

**Economic Wealth-Creation Strategies**

For a firm to create real economic wealth, and thus for a firm to justify a market value in excess of its realizable liquidation value, the firm has to produce economic returns in excess of its cost of capital. In our model, that means the firm's CFROIs must be higher than its discount rates – in other words, a positive CFROI spread. Indeed, the relationship of a firm's CFROI to its discount rate indicates the appropriate strategies for wealth creation.

All else equal, when the CFROI spread is positive, more growth will create additional economic wealth and warrant a higher total market valuation. But the competitive life-cycle reminds us that if there is a high-return opportunity in a large or potentially large market, competition will tend to arise and force returns down toward the average more quickly.

**Figure 10: Value Creation Principles**




*Source: Credit Suisse HOLT*

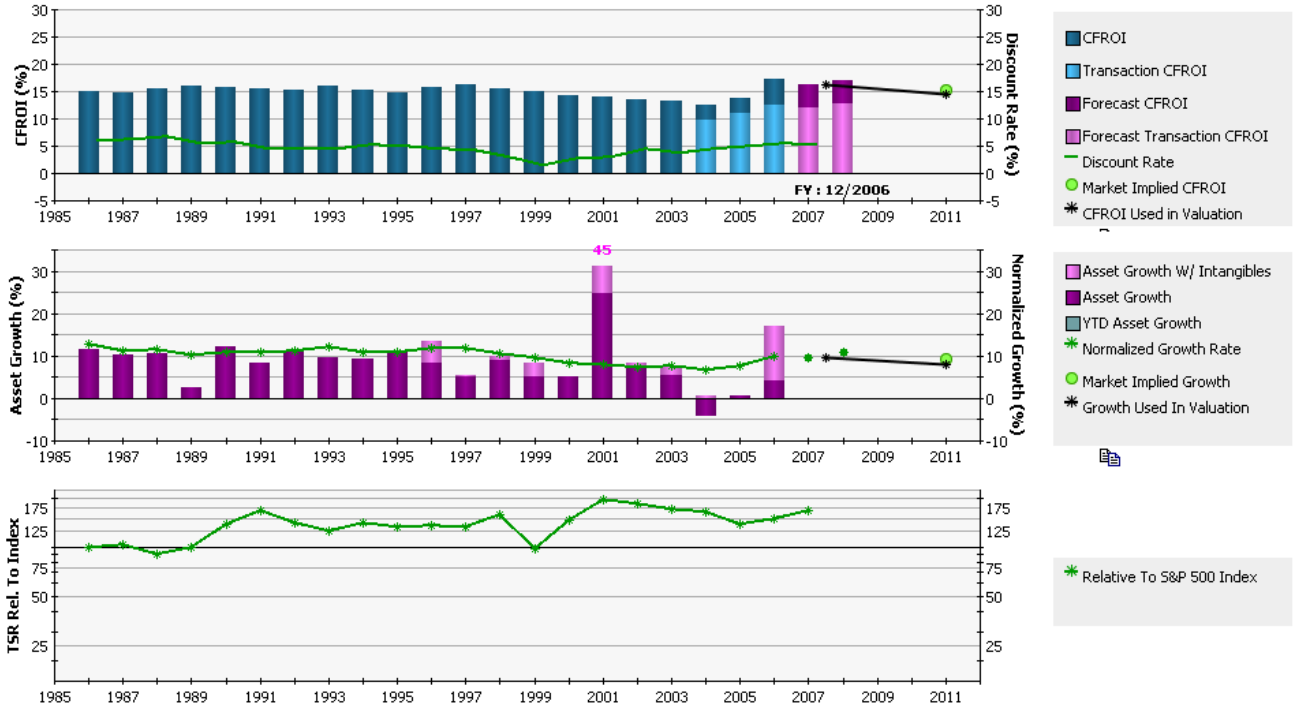
When CFROIs are at the discount rate, an additional $1 of capital investment creates only $1 of economic wealth. In this situation, shareholders are just as well off in having their capital returned via dividends or share repurchases as in having the company make additional capital expenditures in a zero spread businesses.

When firms are in the "final" life-cycle phase, with a negative CFROI spread, each new dollar of investment destroys wealth. Raising the CFROI should have first priority, and this often means contracting assets (selling, spinning-off or closing negative-spread operations). Almost always, a business-as-usual approach will mean slow death for such firms at this stage.

### The Relative Wealth Chart (RWC)

Our RWC enables users (a) to immediately see the company's history, forecasted near-term CFROIs, and market-implied expectations in terms of the key economic wealth-creating variables, (b) to consider the firm's life-cycle status, and (c) to assess the implications in the valuation of its stock price after changes in different variables.

**Figure 11: Relative Wealth Chart**




*Source: Credit Suisse HOLT*

**Top Panel:** From a CFROI level of about 13% in 1984, Abbott Labs (ABT) increased its CFROIs to about 16% in 1989 and maintained returns near that level through 1997, largely warding off life-cycle forces, although CFROIs have declined in recent years. Over the period, ABT's DRs trended downward hitting a low in 1999, contributing to a widening of the CFROI spread from approximately 10% to around 13.5%. But more recently DRs have increased, however, not at the same rate as CFROIs, which have advanced steadily and currently stand a peak level in 2006. The two pink bars at the right end of the historical period are forecasted CFROIs converted from consensus EPS estimates. They drive the T+1 CFROI forecast (the star between the forecast CFROI bars). Subsequent forecast CFROIs (the line) to the CFROI at T+5 (star) reflect typical fade-rate patterns revealed in empirical studies. The dot at T+5 (slightly above the star) is the CFROI level implied by the stock price for T+5. The fact the market implied CFROI (green dot) is approximately at our modelled T+5 CFROI suggests the market is expecting ABT to fade as the model is expecting. If CFROIs were to fade more than implied by the current price, we would expect the stock price to fall further, all else unchanged.

**Middle Panel:** "Asset Growth" is the real annual growth rate in operating assets, including acquired assets. To flag acquisition activity involving purchase accounting, "Asset Growth with Intangibles" is computed as the annual change in intangibles relative to the prior year's operating asset base. "Normalized growth" reflects the available cash flows for reinvestment consistent with both the level of a particular year's CFROI and a continuation of existing capital structure and existing dividend payout policy. Forecasted normalized growth rates for T+1 to T+5 are derived from the forecast CFROIs. Early lifecycle companies that issue capital repeatedly should receive a boost in their asset growth rates; conversely, those mature companies that buy back stock should take on slower asset growth rates. Historically, ABT's normalized growth has slightly exceeded its actual asset growth. A key valuation issue is the size of opportunities for future internal growth at high CFROI levels.

**Bottom Panel:** This is a cumulative index reflecting annual changes in the yearly excess (positive or negative) total return (capital gains/losses + dividends) on ABT's stock relative to the total return provided by the S&P 500. Periods when ABT's shares outperformed (under-performed) the S&P 500 are represented by rising (falling) trends in this index. Over the period shown, ABT shareholders' returns were about 1.7 times more than an investment in the S&P 500 would have produced.

### The Value Chart (VC)

This display of Credit Suisse HOLT's year-end default warranted share prices in the chart below (stars connected by line) together with the high-low range (bars) and year-end actual share prices (open dot) enables users to immediately see how well the share prices generated from our default valuation model tracked actual prices.

For the current valuation, the stars above and below the "best" warranted price (solid dot in T+1) represent our high and low warranted prices. The best warranted price is calculated using the "consensus" EPS estimate and the current company-specific DR. The high (low) warranted price is calculated using the highest (lowest) EPS estimate and a 100 basis point lower (higher) company-specific DR than used for the best warranted price.

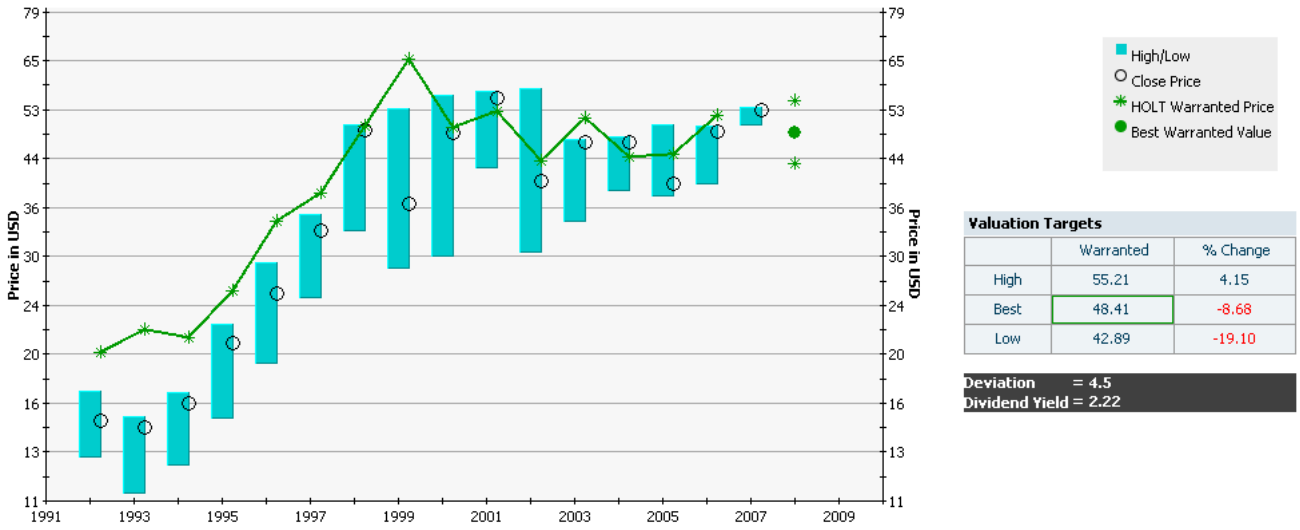
Close tracking (low deviations) indicates our model and default inputs "explain" share prices quite well and support a fairly high degree of confidence in the calculated default warranted prices.

Poor tracking (high deviations) indicates that our default inputs and/or algorithms do not adequately capture the firm's economics. The reason might be readily understandable. For example, ABT's normalized growth rate (see RW chart) was regularly higher than the actual growth rate, which – for a high positive CFROI-spread firm – would tend to produce warranted prices above actual prices. From data in Company Reports or from other sources, an analyst could estimate a more plausible growth rate than the normalized growth rate, input that "smarter" growth rate via the Sensitivity function as an override to the baseline rate, and with a press of a button see the "new" modelled price.

Poor tracking also might be attributable to more obscure causes. When all firms within a sector track poorly, we immediately suspect it is because of some discrepancy in reporting versus economics specific to that sector. This feedback mechanism has initiated many of our research efforts that led to adjustments now incorporated in our database.

Start-up firms and other firms with a wide range of plausible future performance paths also are not likely to track well. In those cases, the historical database and foundation components of our model can, nevertheless, serve as a useful template for organizing thought and debate regarding possible "forecast" scenarios and their share price implications.

**Figure 12: HOLT Value Chart**




*Source: Credit Suisse HOLT*

# Derivatives

*By far the most significant event in finance during the past decade has been the extraordinary development and expansion of financial derivatives. These instruments enhance the ability to differentiate risk and allocate it to those investors most able and willing to take it - a process that has undoubtedly improved national productivity growth and standards of living.* Alan Greenspan, Chairman of the US Federal Reserve.

Derivatives are another form of financial trading that has its origins in history and not in the modern markets. In Genesis Chapter 29, Jacob purchased an option costing him seven years of labour that granted him the right to marry Laban's daughter, Rachel. His prospective father-in-law, however, reneged, perhaps making this not only the first derivative but the first default on a derivative. Laban required Jacob to marry his older daughter Leah. Jacob married Leah, but because he preferred Rachel, he purchased another option, requiring seven further years of labour, and finally married Rachel. Jacob ended up with two wives and twelve sons (who became the patriarchs of the twelve tribes of Israel). Some would argue that Jacob had forward contracts, which obligated him to the marriages, but either way, derivatives were around some c2,000 years BC!

The first derivatives exchange was the Royal Exchange in London, which allowed forward contracting. The celebrated Dutch Tulip bulb bubble, involved forward contracting on tulip bulbs in c1637.

1848 saw the foundation of the Chicago Board of Trade. Due to its location on Lake Michigan, Chicago was a major centre for the storage, sale, and distribution of US grain. However, Chicago's storage facilities were unable to accommodate the enormous increase in supply that followed the harvest and so spot prices fell and rose in a dramatic fashion. A group of grain traders created the to-arrive contract, which permitted farmers to store the grain and deliver it at a later date, allowing for local (cheaper) storage and delivery to Chicago afterwards (limiting the post-harvest glut and the subsequent price fluctuations). Contracts were standardised in c1865.

Over time, the trading of agricultural derivatives widened to include derivatives in other physical commodities, currencies and eventually financial assets. In addition, derivatives began to be exchange traded as well as created over-the-counter (OTC) between individuals.

In 1973 the option pricing model of Fischer Black and Myron Scholes was published and the world of modern derivatives was born.

Within a short period, most large corporates were using derivatives to hedge interest rate, exchange rate and commodity risk.

**The use of Derivatives**

As discussed, the primary objective of an investor is to maximise returns and minimise risk. Derivatives are contracts that address such a desire to manage risk.

Derivatives have no value of their own per se – instead they derive their value from the existence and value of some other asset, known as the underlying. Derivatives are legally binding contracts which carry an agreement or an option to buy or sell the underlying asset up to a certain time in the future at a prearranged price (the exercise price).

The contract also has a fixed expiry period. The value of the contract depends on the expiry period as well as the value of the underlying asset.

As discussed, derivative contracts can be standardised and traded on an exchange. Such derivatives are called exchange-traded derivatives. Alternatively, they can be customised on a bilateral basis. Such derivatives are called over-the-counter (OTC) derivatives. Exchange traded derivatives tend to have higher costs for the same structure (due to exchange fees) but lower counter-party risk.

Some of the most basic forms of Derivatives are Futures, Forwards and Options.

# Futures & Forwards

Futures are derivative contracts that give the holder the opportunity to buy or sell the underlying at a pre-specified price, at some time in the future.

They come in standardised form with fixed expiry time, contract size and price. Forwards are similar contracts but customisable in terms of contract size, expiry date and price, as per the needs of the user.

**Forwards**

A Forward is an OTC contract between two parties agreeing to buy (the long) and sell (the short) an asset on a future date for a set price.

**Futures**

A Future is an exchange-traded forward contract. It is a contract with standardised specifications (expiration, reference underlying, size, etc.). During the life of the contract, margin is paid as the result of the contract being Marked-to-Market.

Settlement can be either cash or physical. Cash settlement is the norm in financial futures such as stock indices and rates (like Eurodollars). Physical settlement is the norm in physical commodities, equities and FX; it is also used for US Treasury Bond Futures.

**Pricing**

Stock ABC is trading at 100. Rates are 5% and there is no dividend. The one-year Forward price is the price that counterparties agree on today to buy/sell ABC in one year. One would not agree to pay more than 105 because one could buy the stock today and carry it for that much. Similarly, no counterparty (i.e. the market) would let you pay less since they have to carry it. The Forward price is the price that makes one (economically) indifferent to buying today and holding or paying the Forward price at maturity i.e. 105 in this example.

**Basis**

The difference between the Spot price and the Forward price is the basis (in the above example 5). It is the net cost of carry. If ABC declares a dividend of 1, reduces the basis to 4 (and the price of the Forward to 104). A change in interest rates also affects the basis because it alters the cost of carry (i.e. the financing of the trade).

**Mark-to-Market**

Futures positions are marked-to-market each day. That is, gains and losses are realised daily.

**Rolling Futures**

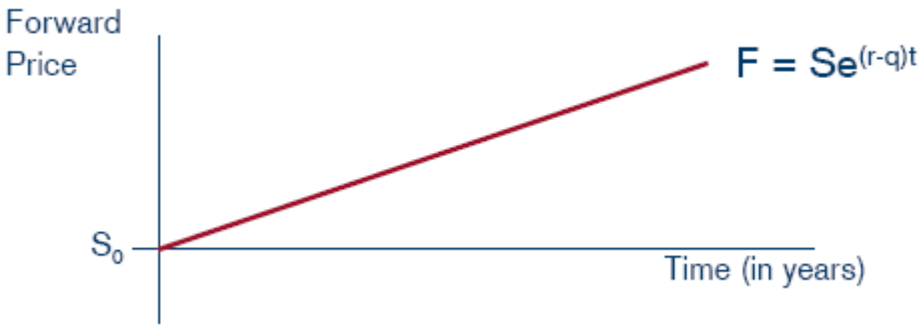
Suppose one established a long June S&P500 position. If one desired to maintain this exposure beyond the contract period (i.e. the following September), one would have to sell the current contract and buy the next – this is rolling the futures position. It is generally not best to wait until the last possible day to do this. If the cost of financing is volatile, the basis and fair value will be more volatile, making the timing of the roll more significant.

**Pricing**

The forward-price in equities depends on spot, interest rates and dividends. It is defined as: $F = Se^{(r-q)t}$, where r = interest rate (continuous time) and q = dividend yield (continuous time) and t = time to expiration.

It is the fair-value price (based on arbitrage) of the stock for the relevant future point in time

**Figure 13: Fair Value of the Forward**




*Source: Credit Suisse*

**Implications of Forward on Structured Products**

If a forward is upward sloping, a bullish product will be more expensive.

If a forward is downward sloping, a bearish product will be more expensive and protection will be more expensive.

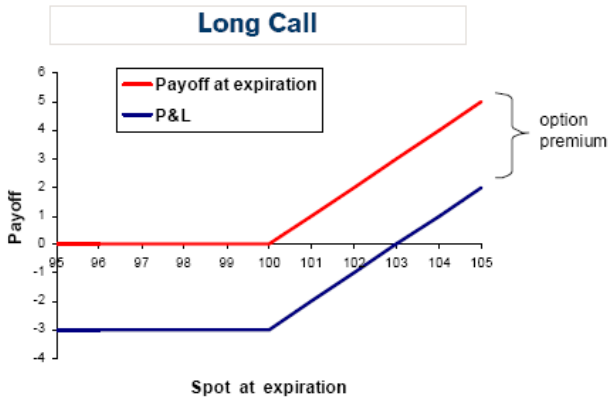
# Options

Option contracts give the holder the option to buy or sell the underlying at a pre-specified price some time in the future. An option to buy the underlying is known as a Call Option.

On the other hand, an option to sell the underlying at a specified price in the future is known as Put Option.

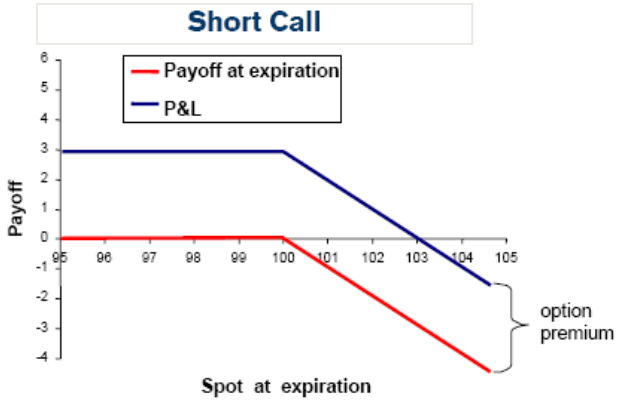
In the case of an option contract, the buyer of the contract is not obligated to exercise the option contract. Options can be traded on the stock exchange or via the OTC market. Listed options tend to be automatically exercised upon expiry.

**Figure 14: P&L of a long 100 call position**



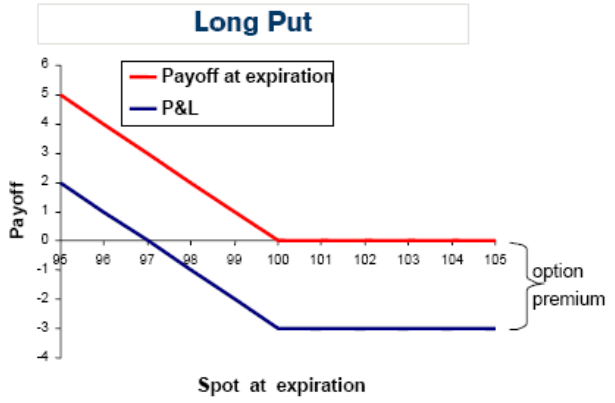

*Source: Credit Suisse*

**Figure 15: P&L of a short 100 call position**



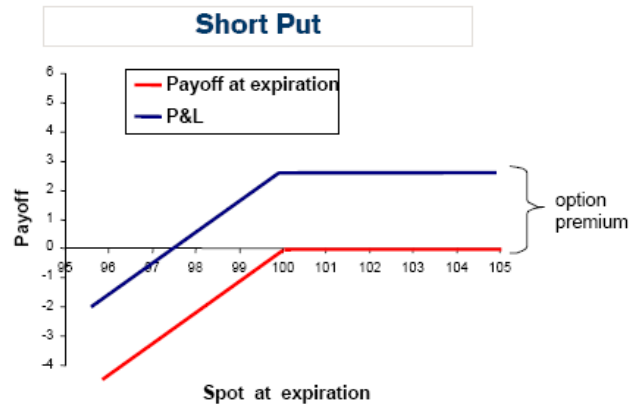

*Source: Credit Suisse*

**Figure 16: P&L of a long 100 put position**




*Source: Credit Suisse*

**Figure 17: P&L of a long 100 put position**




*Source: Credit Suisse*

### Option value

Option Value = Intrinsic Value + Time Value.

Intrinsic Value is the value of the option if exercised today.

Time Value is any value in excess of intrinsic value. Generally speaking, the longer the amount of time for market conditions to work in an investor's benefit, the greater the time value. If the value of the stock remains the same, options decrease in value the closer they get to the expiration date. This is known as time decay.

An option that is Out of the Money or At The Money has only time value. In The Money options have both time and intrinsic value.

An option that can only be exercised at expiration is known as a European Option. An option that can be exercised at any time before expiration is known as an American Option.

### Put-Call Parity

Put-Call Parity defines the relationship between the price of a (European) call option and a (European) put option when both have an identical strike price and expiry. It is one of the most important tenets when it comes to trading puts and calls.

Put-Call Parity can be mathematically derived to show that:

- a call and a put can be used interchangeably in any delta-neutral portfolio. If d is the call's delta, then buying a call, and selling d shares of stock, is the same as buying a put and buying 1 – d shares of stock.
- When there are no dividends or other asymmetric costs of carry (i.e. expensive borrow), the implied volatility of calls and puts must be identical.

**Derivatives Jargon**

**Delta** - The first derivative relating to change in an underlying price. Can be used as the % chance the option will end 'in the money' i.e. an ATM option has a 50 delta (or 50% chance it expires ITM).

**Theta** - daily cost of holding an option position - related to the implied volatility of the option.

**Delta hedging:** buying and selling the underlying asset in according with the "delta" of the option. Using same example, a long ATM put will be long 0.5 shares per option.

**Exchanging delta:** When an option is traded, the buyer and the seller of the option will transact in the underlying asset in order for each of them to have a delta neutral position.

**Delta neutral:** When your underlying option position and underlying asset position combined provides no directional exposure.

**Trading Gamma:** buying and selling the underlying asset in order to keep the position delta neutral.

**Delta Position:** total underlying stock exposure at a price point combining all option positions

**Volatility Skew:** Differential between downside and upside volatility. Generally , downside volatility will be greater than upside volatility.

**Paying Decay:** daily cost of holding the option positions: i.e. Theta.

**Long/Short gamma:** generally being associated to be long or short shorter dated options. Associated with the realized price movement of the underlying and less the movement of the implied volatility.

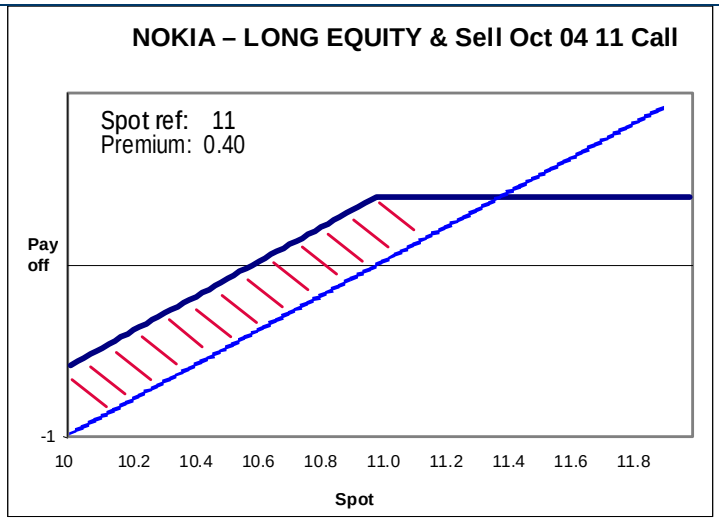
**Long/Short Vega:** long or short volatility associated with the overall options position. Generally associated with longer dated options where implied volatility is a large % of P&L

**Pin Risk:** is the risk associated with spot/strike exposure on the expiry. If you are short on option on expiry and the spot is trading very close to the strike, you are short pin risk.

**Option strategies**

*Yield enhancement* - A widespread approach used by portfolio managers trading around core positions. The trades tend to be short-term directional; either Buy Write (Long Stock, sell Call) or Underwrite (Short Stock, sell Put). These are classified as yield enhancing trades because you are always selling the option to earn a premium (yield), however, they also allow additional time to be right. The risk is that the stock goes against you by more than the percentage premium you earned selling the option. The reward is the premium earned which may (if in the money) end up with the investor closing out the core position for a profit (the difference between the original stock price & the option strike +(call)/-(put) option premium).

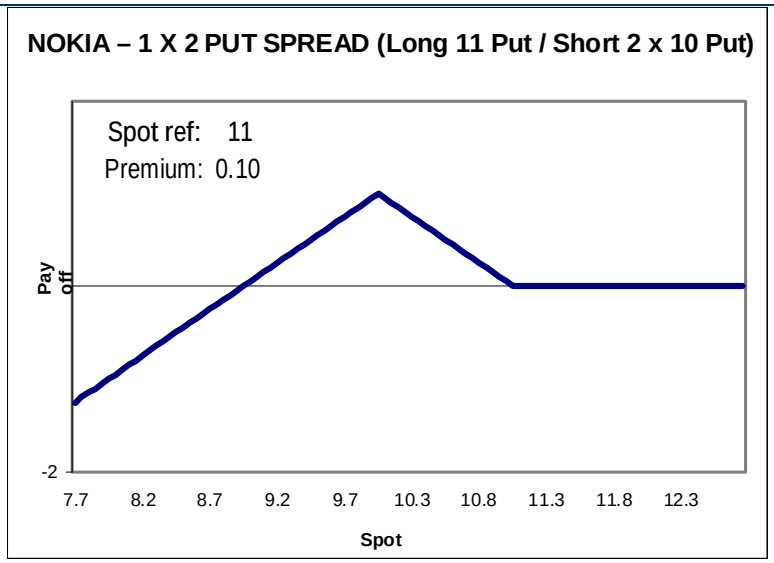
**Figure 18: Overwrite – long equity with short call**




*Source: Credit Suisse*

*Directional* - i.e. calls/puts, call/put spreads, ratio call/put spreads. Advantages in using options: (i) time (longer period to be right / greater tolerance of noise); (ii) stop loss (pay your premium and move on); (iii) leverage (spreads can have very attractive payout ratios). Disadvantages of Options: (i) patience (a day or a week can be a long time in certain markets); (ii) speed to transact (liquidity and profitability will take time); (iii) complexity (multiple positions can get complicated with dynamic factors); (iv) unlimited loss associated with short positions. Overall, using options alone is not that straightforward and in reality a combination is often best, using the equity alongside an options strategy which brings out the best of both approaches.

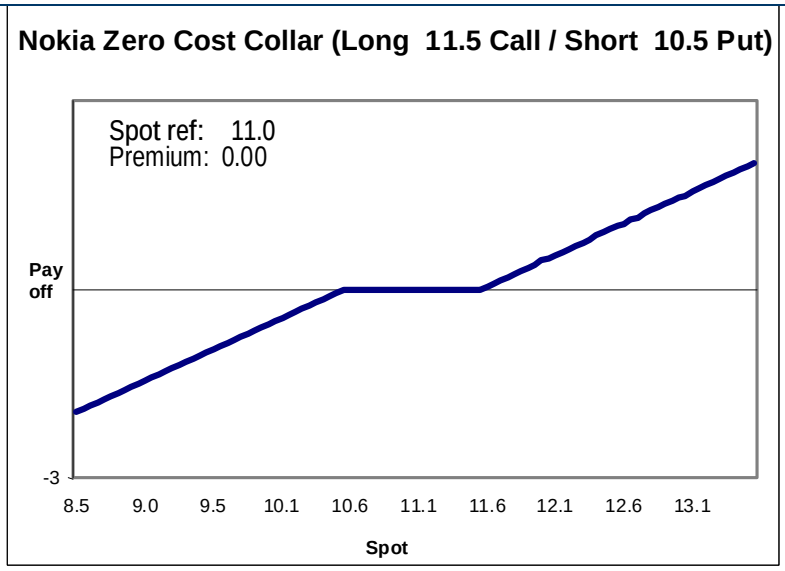
**Figure 19: Ratio spread – trading a limited movement down to a target price**




*Source: Credit Suisse*

*Leverage / Protection* – Leverage: enhance a core stock position using puts or calls – i.e. leverage a long position by buying calls; alternatively leverage a short position by buying puts (both provide a stop-loss on the leverage equity). Protection: buying puts against core long positions; i.e. a *collar protection*: - buy put protection financed by selling calls (a cheaper alternative if willing to forego full upside potential).

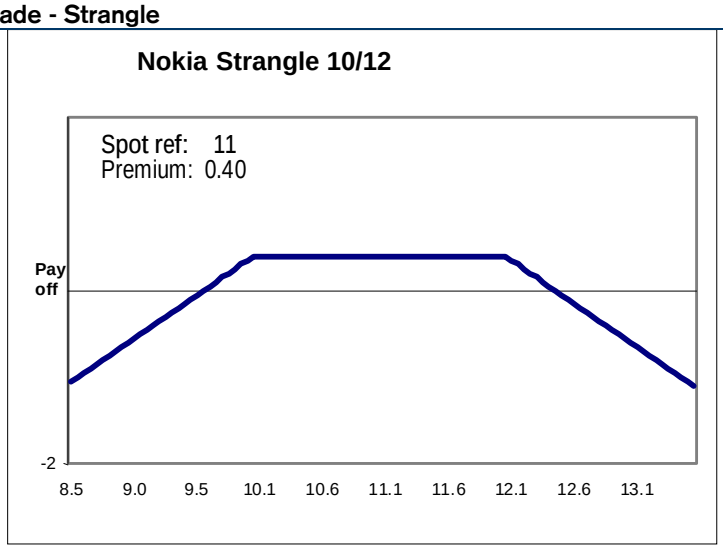
**Figure 20: Risk Reversal trade – strong directional view**




*Source: Credit Suisse*

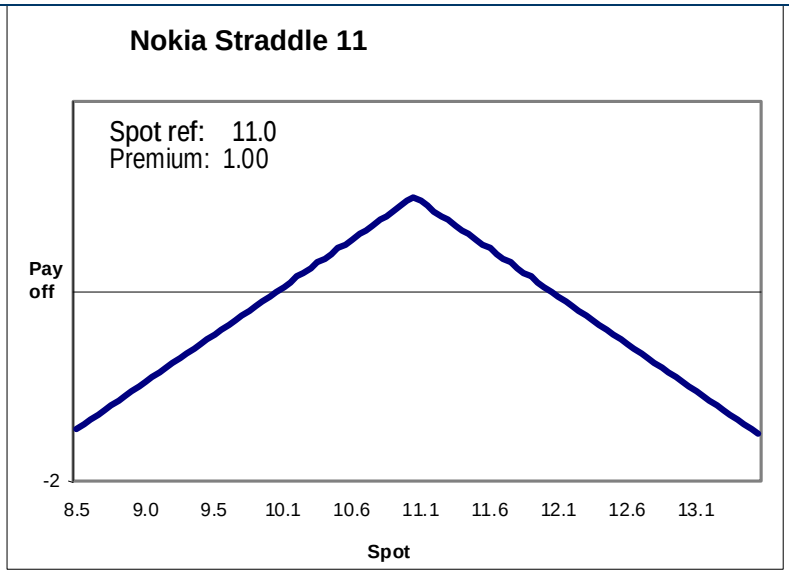
*Range-bound* - straddles, strangles, butterflies. Further development of yield enhancement, by expressing a view that a stock is range bound. Strategy can be traded in 2 ways: (i) around a core position to express both an addition level and an exit level (for all or part), or, (ii) without a core position to set a new long / short trade entry level and earn percentage return in between. If a new position is not desired then a Butterfly should be used instead.

**Figure 21: Range-bound trade - Strangle**



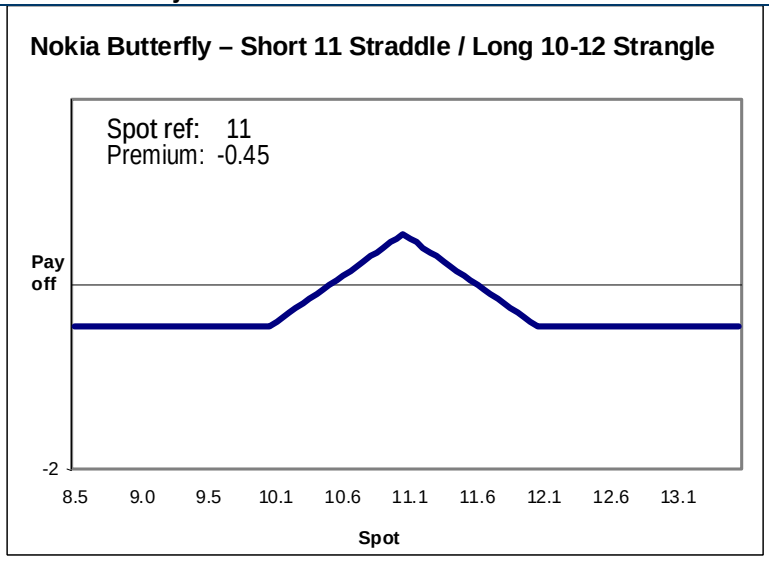

*Source: Credit Suisse*

**Figure 22: Range bound trade - Straddle**




*Source: Credit Suisse*

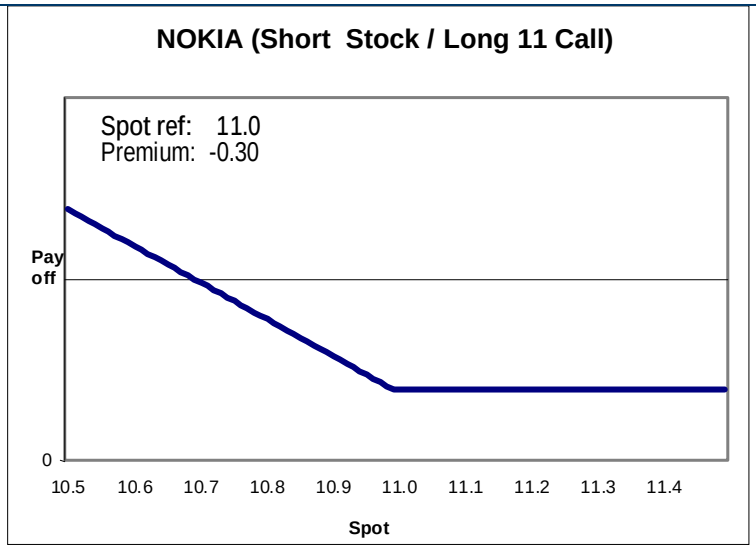
**Figure 23: Range-bound trade - Butterfly**




*Source: Credit Suisse*

*Physical stock strategies (no delta)* - synthetics – used around dividend positioning, borrow plays. Investor buys an option and combines it with an equity position to create a synthetic position which mirrors a single long option strategy. No exposure to underlying spot price, so zero delta An investor can create a synthetic position to benefit from an increase in dividend or a synthetic position to benefit from any increase in stock borrow costs. This allows the investor to reduce the risk profile; to insert a stop loss with flexibility (non immediate); to decrease noise in the trade / increase tolerance; or to take a bigger view and avoid over trading.

**Figure 24: Synthetic option position (short equity and long call to create a long put)**




*Source: Credit Suisse*

**Option strategy selection factors**

Time Period – (i) Event / Short term performance / Longer term view; (ii) Basis for decision - Technical / Fundamental.

Target – (i) Price level / Price Zone / Current Range / Breakout; (ii) Volatility of Path

Risk / Reward – (i) Confidence in Opinion; (ii) Level of Participation; (iii) Volatility of micro & macro market.

Flexibility – (i) Liquidation speed; (ii) Involvement in Equity

In summary there are numerous ways to play directional equity views using options (and indeed, even if you expect the underlying equity to do nothing). The best approach tends to be a combination of equity and options which gives all option advantages but keeps the speed and flexibility component.

**Option valuation - Black Scholes.**

Published by Fisher Black and Myron Scholes in 1793, the Black-Scholes option valuation formula attempts to calculate the fair economic value of an option for both buyer and seller, the price at which (exclusive of commissions) both a buyer and seller would, on average, break even if they repeated this trade many times. Thus, the calculated price does not favour either the buyer or seller, so it is a price they can agree on. The valuation model uses probability theory, discounted cash flows, and expected value calculations.

The **underlying basis for the model** is: (i) that the underlying stock price will fluctuate in the manner of a random walk. It will go up sometimes and down sometimes, with small moves in either direction being very likely and large moves in either direction being very unlikely; (ii) that the actual direction the stock will move during the holding period is not predictable, by anyone, using any prediction method; and (iii) that the volatility of a particular stock, the amount by which its price fluctuates during a given time interval, is a stable measurement for that stock. That is, one can expect that stock to exhibit the same volatility in the future that it has had in the past. This last assumption is perhaps the most controversial and subject to the most critique.

**Assumptions of the Black and Scholes Model:**

1) The stock pays no dividends during the option's life - most companies pay dividends to their share holders, so this might seem a serious limitation to the model considering the observation that higher dividend yields elicit lower call premiums. A common way of adjusting the model for this situation is to subtract the discounted value of a future dividend from the stock price.

2) European exercise terms are used - European exercise terms dictate that the option can only be exercised on the expiration date. American exercise term allow the option to be exercised at any time during the life of the option, making American options

more valuable due to their greater flexibility. This limitation is not a major concern because very few calls are ever exercised before the last few days of their life. This is true because when you exercise a call early, you forfeit the remaining time value on the call and collect the intrinsic value. Towards the end of the life of a call, the remaining time value is very small, but the intrinsic value is the same.

3) Markets are efficient - this assumption suggests that people cannot consistently predict the direction of the market or an individual stock. The market operates continuously with share prices following a continuous Itô process. To understand what a continuous Itô process is, you must first know that a Markov process is "one where the observation in time period t depends only on the preceding observation." An Itô process is simply a Markov process in continuous time. If you were to draw a continuous process you would do so without picking the pen up from the piece of paper.

4) No commissions are charged - usually market participants do have to pay a commission to buy or sell options. Even floor traders pay some kind of fee, but it is usually very small. The fees that Individual investor's pay is more substantial and can often distort the output of the model.

5) Interest rates remain constant and known - the Black and Scholes model uses the risk-free rate to represent this constant and known rate (normally 30 day US Treasury T-Bills). During periods of rapidly changing interest rates, these 30 day rates are often subject to change, thereby violating one of the assumptions of the model.

6) Returns are 'lognormally' distributed - this assumption suggests, returns on the underlying stock are normally distributed.

**A simplified summary of the Black-Scholes model:**

An underlying share has a characteristic volatility that one can expect it to exhibit during the life of the option. Although one cannot predict the future price of the share, one can (from the volatility) calculate the statistical probability that on the option's expiration date the share will have reached or exceeded each possible target price. At each target price, the option will have a knowable value which is its intrinsic value, the amount by which it is in the money.

Because one knows each possible outcome of this situation (the various target prices), the statistical likelihood of each outcome, and what the return will be from each of the possible outcomes (the option's value), one has enough information to calculate the expected value of this option by using a payoff table.

The actual return one gets from one trade might not be this average value, but if one were to repeat this situation many times, this would represent the average return of all those trades.

For both puts and calls, the higher implied volatility, the higher the option price.

**Figure 25: The Black-Scholes Option Price Formula**

$$Call = S \cdot N(d_1) - K \cdot N(d_2) \cdot e^{-rt}$$

*where*

- Call = The price of the call option (premium)
- S = Price of the underlying asset
- N(.) = Cumulative normal probability function
- K = Exercise Price
- t = Time to expiration (in years)
- r = Interest rate (annual)
- e = The exponential function
- $d_1 = \left[ \ln\left(\frac{S}{K}\right) + (r + 0.5\sigma^2)t \right] \div \sqrt{\sigma^2 t}$
- $d_2 = d_1 - \sqrt{\sigma^2 t}$

$\sigma^2$ = Variance of the price changes of the underlying security

*Source: Credit Suisse*

# Convertible bonds

What is a Convertible bond?

Classic definition: a corporate (risky) bond plus an embedded equity warrant.

- Alternatively, a corporate bond plus an embedded equity (usually OTM) call option.
- "Warrant" appropriate if conversion results in new share issuance, and hence dilution.

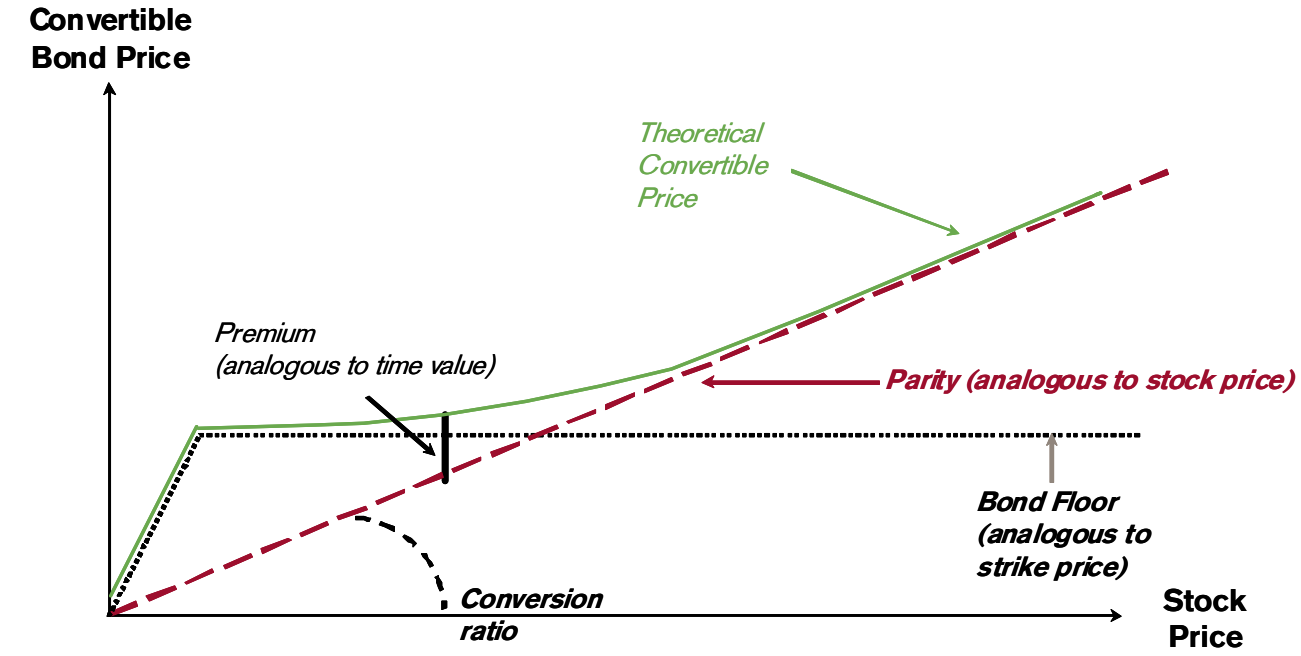
**Figure 26: Convertible bond characteristics**


*Source: Credit Suisse*

**Understanding the product—terminology**

- Par Value: Face value or nominal value of the bond. Generally, the issue price, redemption price and par value will be equal. However, for convertibles issued at a discount, the redemption price will be higher than the issue price. In this case par value is equal to the redemption price.
- Conversion Ratio: Set at issue, the number of shares into which each bond may be converted.
- Parity: The value of a convertible if it were immediately converted in bond terms (Parity = Conversion Ratio x Current Share Price).
- Conversion Premium: Excess of the bond price above parity expressed as a percentage (Conversion Premium = (Bond Price – Parity)/Parity).
- Yield to Maturity: Equal to YTM for normal bonds (annual gross redemption yield to the final maturity).
- Investment Value/Bond Floor: The level at which a straight bond with the same maturity and coupon would trade. Provides a "floor" for the price of the convertible if it loses all its equity content and it trades as a pure fixed income instrument.
- Call Provisions: Issuers' option to call the convertible bond, usually given 30 days notice. Given low coupons typically attached to convertibles, is rarely exercised because of interest rate movements. Normally used to force conversion.
    - Soft call: Subject to equity performance trigger, i.e., minimum parity 130% (typically time conditional i.e. 20 / 30 days).
    - Hard call protection: Not callable for a given period.
- Convertible: Into new shares.
- Exchangeable: Into existing shares – often into shares of a company other than those of the issuer.

**Figure 27: Convertible price as a function of share price**



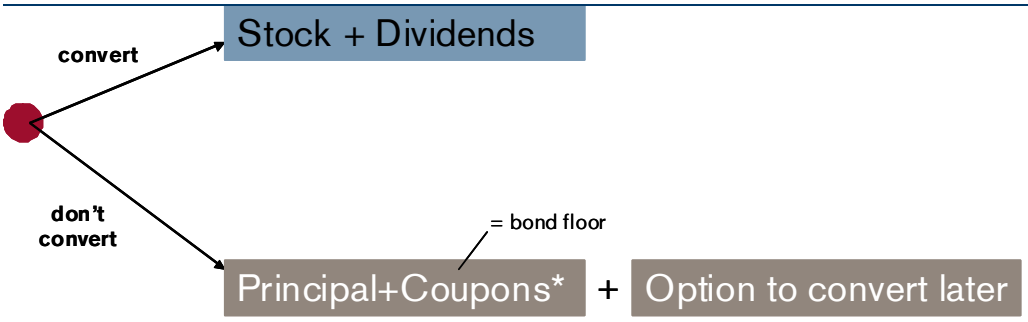

*Source: Credit Suisse*

**To convert or not convert?**

Bondholders (usually) have the right to convert at any time.

- Typically, bondholders do not convert early (unless about to be called away).
- Exception to this: near maturity, may be advantageous.

**Figure 28: Convert scenario analysis**

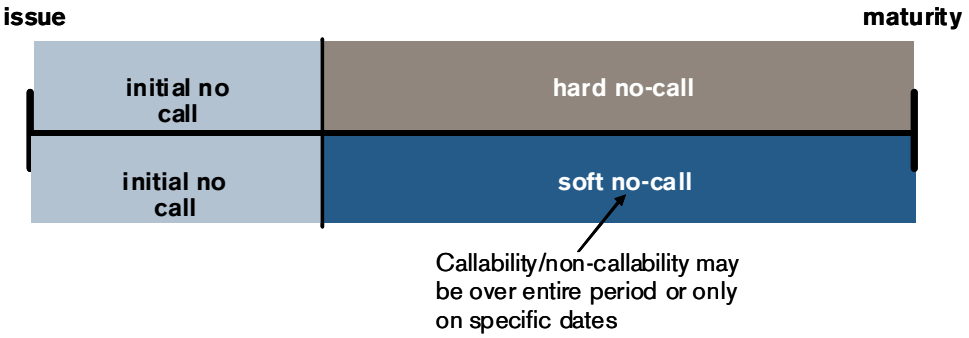



*Source: Credit Suisse*

**Call protection**

- Time-line:
  - Hard-call protection: issuer cannot call for any reason.
  - Soft-call protection: issuer cannot call unless price is greater than or equal to trigger.
- Hence, effective maturity is uncertain and highly path-dependent.

**Figure 29: Call protection time line**




*Source: Credit Suisse*

**Pricing convertibles**

- CB valuation depends on fixed income and equity factors.
- Fixed income factors:
    - Interest rates, credit spread, credit spread volatility, correlation between equity/credit spread.
- Equity factors:
    - Share price, equity volatility, dividends, skew…
- In practice, however, the majority of CB investors use one-factor valuation models.
    - Only stochastic variable = equity.
    - One-factor model does not work well for high yield/distressed issuers.
    - If two factors are used, they are typically equity price and credit spread.

**Important definitions**

Coupon: Annual payment to the bondholder.

Maturity: Final redemption date (shown in US format, i.e., Month, Day, Year).

Next Put: A feature that allows bondholders to redeem the bonds prior to maturity, thus shortening duration—this can be a significantly value enhancing feature.

Current Yield: Coupon divided by principal (market price).

Parity: Value of the underlying equity as a percentage of par—the value of the shares if the bond were converted today.

Premium (points): Market price of the bond less parity.

Breakeven (years): Premium divided by annual coupon rate less the unprotected dividend; approximate measure of the time it takes for coupon payments to amortise the premium.

Ratchet: In the event of a takeover, most jurisdictions provide for a 'look-through' price to be offered to holders of the convertible bond; bondholders should be able to claim for parity (at the level implied by the bid price for the shares). In order to prevent this from being disadvantageous to bondholders, most convertible bonds contain a ratchet mechanism which aims to compensate bondholders accordingly. This 'takeover ratchet' can be very valuable and in some cases result in a return on the bond that exceeds that accruing to the equity in such situations.

**The Breakeven Trade explained**

The price paid to own a convertible consists of (1) parity, i.e. the value of the shares the investor would receive if converted today; and (2) a premium. Owning the convertible can be viewed as owning the shares which the bond is convertible into (parity), plus the stream of coupons receivable until maturity. In some cases presented in this report, the premium, i.e. difference between bond price and parity, is less than the sum of this coupon stream. As an example, take British Airways 5.8% due August 2014: given a conversion price of £1.89, parity of this bond is 121% (current share price of £2.314 divided by strike). Coupons are paid semi-annually, and with the bond maturing in August 2014 and assumed to remain in the money, an investor would choose to convert shortly before maturity, thus sacrificing the last semi-annual coupon payment. Accordingly, 3.9 years' worth of coupons are still to be received. However, assuming a bond price of 138.6%, the premium paid over parity is 16.4%; this

equates to 2.8 coupon payments. In effect, investors in the bond are buying the underlying equity (parity), and getting 3.9-2.8=1.1 coupons 'for free'. Should the equity decline substantially, the debt aspect of the bond should become more prevalent, i.e. the claim for 100%, which should dampen the fall, and in a worse case scenario puts the bondholder in a superior position to an equity investor.

**The Takeover Ratchet explained**

In the event of a takeover, most jurisdictions provide for a 'look-through' price to be offered to holders of the convertible bond, i.e. bondholders should be able to claim for parity (at the level implied by the bid price for the shares). This can be disadvantageous to bondholders, for example those that have paid a, say, 40% premium to purchase a bond at issue, and find the issuer the next day subject to a bid at a 30% premium to the closing share price, would have incurred a net loss on their purchase. Therefore, most convertible bonds contain a ratchet mechanism which aims to compensate bondholders accordingly. The conversion ratio is adjusted according to a formula which generally takes into account the initial premium paid and the time lapsed since issuance; parity is therefore increased, often to extent where this 'takeover ratchet' can be very valuable. In some cases this can result in returns on the bond that exceed that accruing to the equity in such situations. Further, many bonds contain a 'par put' clause that gives the bondholder the right to require the issuer to redeem the bond at par plus accrued interest.

# Delta One

# Exchange Traded Funds (ETFs)

**What is an ETF?**

Exchange Traded Funds (ETFs) are open-ended investment vehicles whose shares trade on an exchange, like shares. This is unlike typical funds' shares, which can only be bought and sold versus the fund sponsor. The composition of the fund – the underlying mix of securities which generates the target return – is defined formulaically, making the fund holdings completely transparent. This allows for a real-time calculation of the fund's net asset value (NAV) to be produced intraday. The fund sponsor designates certain authorized participants (usually large broker dealers) who can purchase blocks of newly-created fund units directly from the sponsor for cash or in exchange for the delivery of the replicating share portfolio; existing fund units can be redeemed similarly. This creation and redemption process provides a mechanism for the direct transfer of the liquidity of the underlying share portfolio to the ETF shares allowing much larger size to be traded than what the on-screen ETF liquidity would imply.

**Types of ETFs**

The ETF offering is very broad with more than 1000 products covering all major global, regional and national benchmark indices as well as many style, sector, emerging market and thematic cross-sections. There are also ETFs referencing underlying assets from other asset classes including fixed income, credit, currency and commodities.

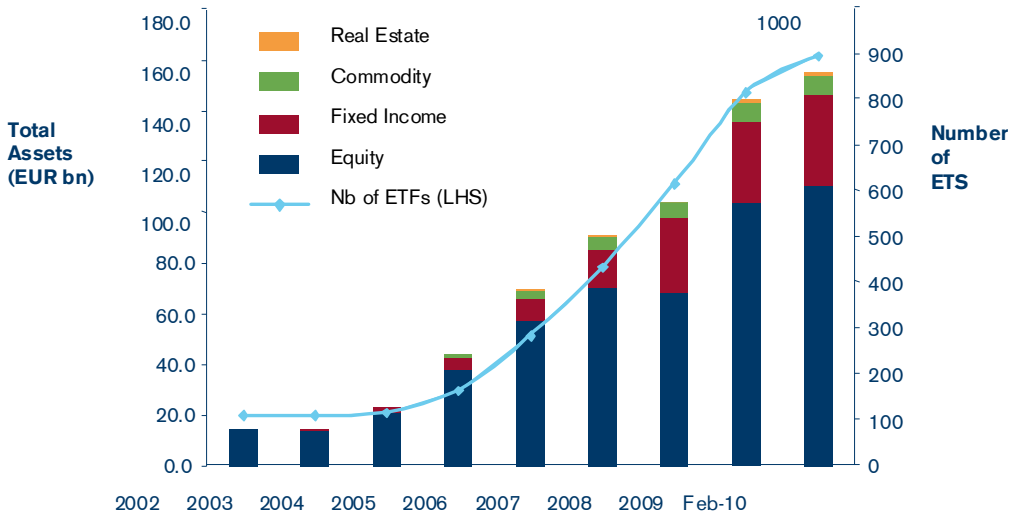
**ETF Markets**

The European ETF market, in existence since around 2000, has seen tremendous growth in recent years with assets at approximately US$250bn in value – around 20% of the global market, from 35 providers on 18 exchanges

At the end of February 2010, the European ETF Industry had 892 ETFs with 2,490 listings

Although ETF were originally designed to track equity markets, they are also valid vehicles in the fixed income and commodities markets. Their use in the real estate and alternative investment space is also starting to grow.

**Figure 30: The growth of the ETF market in Europe**




*Source: Credit Suisse*

- Primary Market: ETFs referencing many different global underlying assets are listed on US, European and Asian exchanges. In Europe it is common for equivalent, fungible lines of the same ETF to be listed on multiple exchanges.
- Secondary Market: In some cases on-screen secondary market liquidity is excellent while in others it may be necessary for a broker to intermediate to facilitate large orders or improve a wide on-screen bid/offer spread. Because brokers can unwind positions obtained through client facilitation via the creation and redemption process, there is no obstacle to investors opening and closing positions with different brokers.

**Price of ETFs**

ETFs trade at the NAV of the underlying index it replicates. Depending upon the ETFs on-exchange liquidity there is a potentially of discrepancy between the price of the ETF shares and the underlying index the ETF tracks, therefore, leading to a potential arbitrage opportunity. The open architecture, free creation and redemption will allow arbitrageurs to enter the market, trading the ETF vs. the underlying index, bringing it back in line.

**Costs of ETFs**

- Execution Costs: Commission rates are similar to share execution commission rates.
- Management Fees: Fees vary widely, depending on the complexity of the underlying portfolio and costs of replication (swap replicated ETFs are often cheaper).

**Where do ETFs add value ?**

- Quick, simple, and transparent instrument providing exposure to a predetermined index, asset class or fund .
- Covers broad asset classes: equities, fixed income, commodities, currencies, real estate, and money markets.
- Leveraged and short ETFs have increased investor opportunities and flexibility to express investment views .
- Ability to go short by borrowing ETFs or buying directionally short ETFs .
- Trading flexibility, exchange listed with continuous pricing throughout the day.
- Transparency, underlying portfolios available daily with real-time indicative NAVs.
- Execution flexibility, ability to trade with multiple counterparties.
- Viable solution for clients seeking benchmark exposure, who cannot use futures or swaps due to internal policy or other regulatory restrictions.

**Replication**

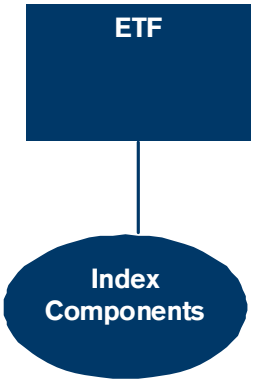
The replication structure of an ETF is one of its defining features. There are two different ways of replication: **physical based** and **swap based** replication.

A **physical** ETF is a straightforward approach consisting of the fund manager holding a basket of securities proportionally equal to the benchmark index. This structure offers a greater transparency due to the full disclosure of the holdings of the ETF. On the other hand, physical based ETFs typically experience higher tracking error than swap based ETFs due to a number of factors such as corporate actions and dividend treatment.

**Figure 31: Physical based ETFs**

**Physically backed – Full Replication**

- Higher transparency - backed by stocks of the underlying benchmark
- Reduced counterparty credit risk - **not** risk-free due to securities lending at fund level, bearing counterparty risk of the borrower, risk of collateral as well as operational risks
- Higher execution related costs - e.g. stamp tax on UK stocks via creation
- Potentially higher tracking error (e.g. corporate actions)



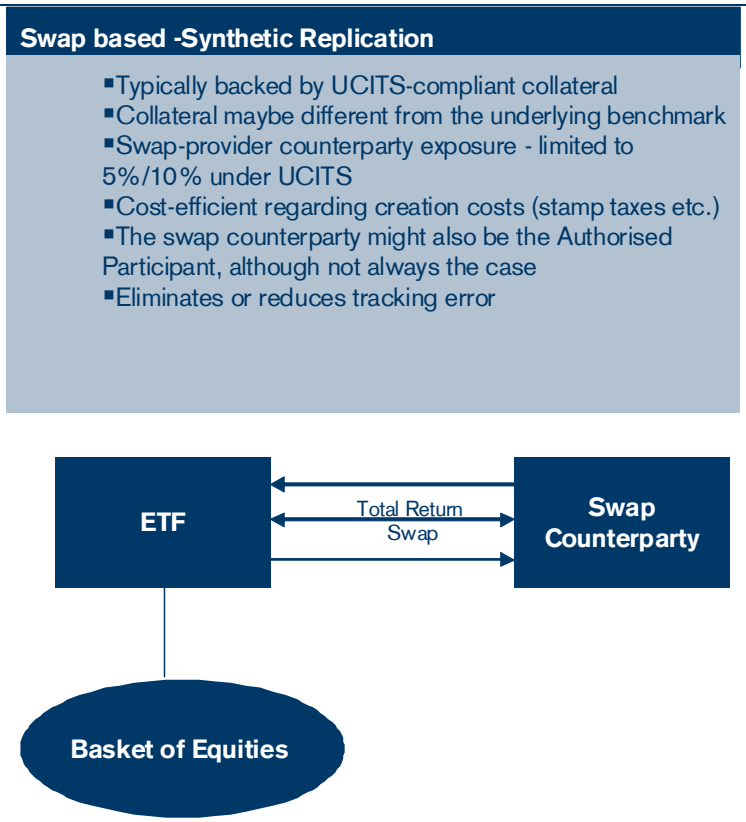

*Source: Credit Suisse*

A different approach is a **swap** based ETF. In this case, the index replication is achieved by an index swap agreement between the ETF manager and one or multiple swap counterparties. The ETF will hold a basket of securities, and exchange its performance for the performance of the benchmark index, provided by the counterparty. Differences in the performance of the basket and that of the index will be counterbalanced by the swap payments.

Under the swap agreement, the fund actually out-sources the tracking error management to a swap counterparty, who guarantees the performance of the underlying index on a daily basis. The drawback arising from this structure is the ETFs exposure to swap counterparty risk. This risk appears when the index outperforms the basket of securities as in this case the counterparty is

obliged to pay the difference. In addition, the counterparty risk is limited to a 10% of the funds value as per the UCITS III regulation on swap exposure. This means that when the swap exposure is close to a +/-10%, it will be rebalanced to achieve a 0% swap exposure.

**Figure 32: Swap based ETF**




*Source: Credit Suisse*

**Swap backed ETF example**

Step 1

The fund invests in a basket of securities with a NAV of $100 and the benchmark index has a level of $100. The fund enters into a swap agreement with counterparty. The ETF exposure to the counterparty is zero at this stage.

Step 2

The following day, the benchmark index rises by a 6%, while the basket of securities remains flat. The exposure to the swap counterparty will be 5.66%. This is calculated as the difference between the NAV of the index and that of the basket of securities, as a percentage of the index NAV; (106-100)/106. As the exposure is significantly below 10%, the swap does not need to be rebalanced.

Step 3

The next day the benchmark index rises by another $6 while the basket of securities only increases by 2$. At this point, the NAV of the index would be equal to $112 while that of the basket would be $102. Thus, the exposure to the swap counterparty would be 8.93%; (112-102)/112.

Step 4

Finally, as the exposure to the swap counterparty is close to 10% the swap needs to be rebalanced. The counterparty pays the difference ($10) to the fund, which then reinvests this into the substitute basket balancing the NAV of the index and the basket to $112, resulting in a zero swap counterparty exposure.

# Swaps

**What is a Swap?**

Swaps are derivative contracts written between two counterparties offering leveraged access to an underlying equity. Client can receive underlying upside equity performance / pay interest at Libor + spread and receive dividends or receive downside equity performance, receive interest at Libor – spread (includes borrow cost) and pay dividends.

**Types of Swaps**

With swaps, investors have complete flexibility to choose from any standardized index or to create customized baskets of shares specifically tailored to their needs. The primary limitation is the ability of the broker to replicate the return of the specified underlying assets. Swaps are particularly useful as a means of gaining access to emerging markets, especially in restricted, illiquid or "frontier" markets where standardized products may not exist. Swaps are also available in other asset classes including commodities, currencies, fixed income and credit.

**Swap Products and Uses**

**Single Share Swaps**

- Vanilla product for gaining leveraged access to global markets with economic and operational benefits
- Gain access to emerging markets, especially in restricted, illiquid or "frontier" markets where standardized products may not exist (e.g. Middle East, Korea, India, China)
- Potentially yield distributions can differ between swap and cash
- Efficient management of certain tax risks e.g. Fin 48

**Index and Sector Swaps**

- Facilitates exposure to a broad base of sectors and indices in a single instrument
- Access to markets and country indices that can be otherwise difficult to trade and maintain
- Credit Suisse offers access to approximately 3,500 indexes and sectors
- Positions are reported along side single share positions to give a portfolio view

**Term Swaps (6-12 months)**

- A single, index or sector swap can be structured as a term swap
- Potential outperformance generated through efficient share lending of the underlying
- Efficient from cost and operational perspective

**Client-Defined Swaps**

- Bespoke, cost-efficient instruments providing highly customisable solutions
- Gain long or short exposure to a broad range of equities, indices, sectors as a single packaged instrument
- Baskets can be tailored to specific needs down to individual components

**Thematic Swaps**

- Credit Suisse can provide ideas for the composition of specific baskets based on rigorous analysis on suitability
- Leveraging Credit Suisse's market-leading Equity Research, award winning HOLT and Derivatives Strategy.

**Swap Markets**

Swaps are an OTC product and positions opened with one broker must be closed out with the same. The transfer of ownership of the swap – called a "novation" – is extremely rare. Swap exposure can be transferred between counterparties by closing out with one and opening with another at a specified reference point.

**Price of Swaps**

Swaps are not a traded product; they are a mechanism by which a client gains exposure to an underlying asset. As such, the liquidity in the swap is entirely determined by the liquidity available in the underlying portfolio of shares: swaps on liquid assets are liquid, and swaps on illiquid assets are illiquid.

**Costs of Swaps**

- Execution Costs: Execution commissions are generally based on the weighted average of the commission rates that would be charged on the execution of the underlying hedge, plus any fees, taxes, stamp or levies charged by the exchanges on which those shares trade.
- Financing Costs: In return for leverage, the funding leg of the swap will carry a spread over the reference interest rate.

# Swap transaction flow – Long position

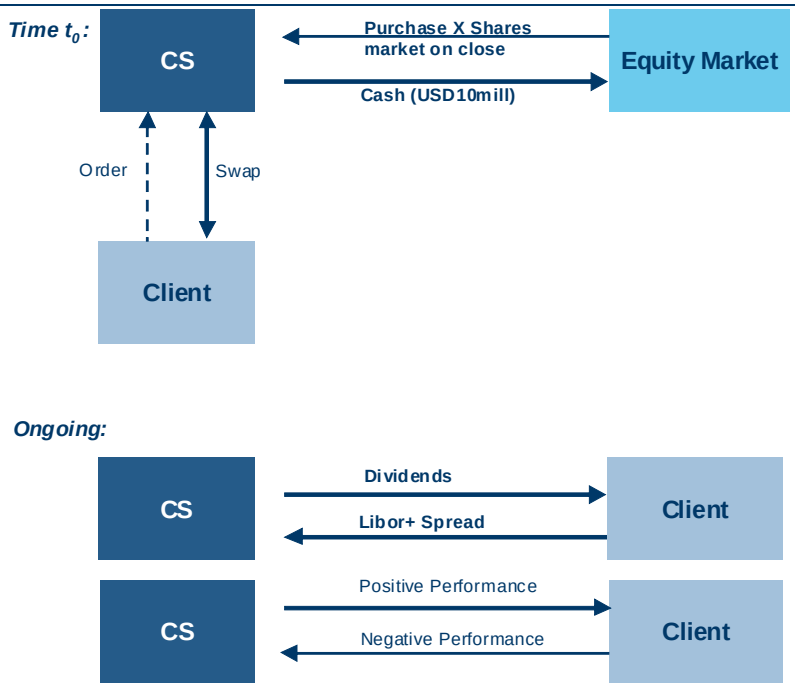
**Time t0:**

- Client places an order to go long X Shares in a notional of USD100mill with Credit Suisse (CS). The trade is executed market on close
- Simultaneously, CS enters into a swap transaction with the client, whereby CS is the Total Return Payer

**Throughout the life of the transaction:**

- CS will pay to the client the Total Return on the underlying assets, consisting of equity, interest and other periodic payments, such as dividends, during the life of the transaction
- Swap is reset as frequently as the client requires both on the equity and interest leg:
- Equity leg: CS pays the client positive asset performance, client pays CS any negative performance on the underlying. Performance under the equity leg is realised as per frequency specified
- Interest leg: Client pays CS overnight LIBOR + Spread. The spread represents the financing charges during the life of the transaction. Interest is calculated and posted as per frequency specified
- Dividends: CS will manufacture payments equal to any dividends, capital repayments, and/or corporate actions, on the underlying equity, to the client.

**Figure 33: Swap transaction flow – long position**



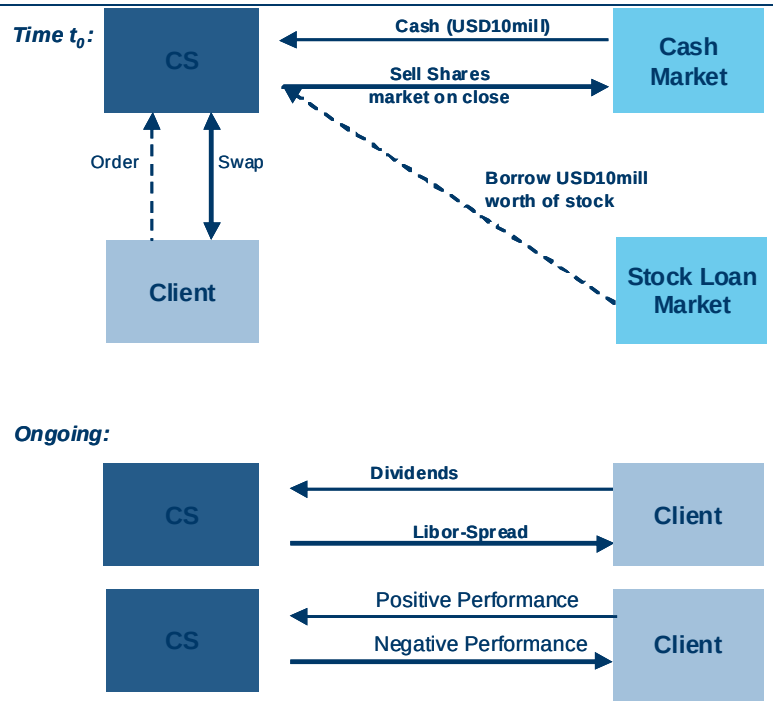

*Source: Credit Suisse*

# Swap transaction flow – Short position

**Time t*0*:**

- Client places an order to sell short X Shares in a notional of USD100mill. CS sources the stock in the stock loan market to facilitate the trade
- Simultaneously, CS enters into a swap transaction with the client, whereby the client is the Total Return Payer
- Throughout the life of the transaction:
- Client will pay CS the Total Return on the underlying assets, consisting of equity, interest and other periodic payments, such as dividends, during the life of the transaction
- Swap is reset as frequently as the client requires both on the equity and interest leg:
- Equity leg: Client pays CS the positive asset performance, CS pays the client any negative performance on the underlying. Performance under the equity leg is realised as per frequency specified
- Interest leg: CS pays the client overnight LIBOR – Spread. The spread represents financing charges during the life of the transaction. Interest is calculated and posted as per frequency specified
- Dividends: Client will manufacture payments equal to any dividends, capital repayments, and/or corporate actions, on the underlying equity to CS.

**Figure 34: Swap transaction flow – short position**




*Source: Credit Suisse*

# Futures

**What is a Future?**

A futures contract is an exchange-listed contract for the delivery of an underlying security (index or single share) at a future time. Futures expire quarterly at which point the contract is settled either through the physical delivery of the underlying security for single shares, or via a cash payment for index products based on the closing out of the position at a price equal to the reference index level at maturity.

**Types of Futures**

The product offering for futures is much narrower than for other products and is limited to the more popular broad and sector indices and highly-liquid single shares.

**Future Markets**

- Primary Market: Trading in futures contracts is highly centralized with most contracts listed on only one exchange and few multiple-listings.
- Secondary Market: Many index futures have extremely active secondary markets. For those that do not, brokers may be able to intermediate and provide liquidity based on the underlying index portfolio or single share.

**Price of Futures**

In the same way as ETFs, the liquidity of the futures market is equal to the sum of the natural liquidity in the contracts themselves and the pass-through liquidity from the underlying share basket. Unlike ETFs, however, there is no creation / redemption process and the broker will, in many cases, have to carry the share basket versus futures position until expiry. These carry costs will be implied into the futures basis at the time of trade and into the roll as well. Pricing will also be influenced by the broker's ability to replicate the expiration price of the future without slippage. While exchange-listing means that a position opened with one broker can be closed out with another, it is generally preferable to open and close positions in less liquid contracts with the same broker to avoid paying the full bid-offer spread in the futures basis.

**Costs of Futures**

Execution Costs: The per-contract cost of executing futures is very low – equal to only a couple of basis points in most U.S. and European contracts. However, to maintain exposure the position needs to be rolled quarterly, which incurs double commissions each time.

Financing Costs: The financing cost of a futures contract is factored into the basis. In contracts with a liquid secondary market, the futures basis will generally reflect market levels of interest rates (i.e. LIBOR rates for the relevant time period).

Selection of the most efficient beta or hedge is largely driven by specific trading needs, tracking error tolerance, transaction size, transaction frequency ….

**Figure 35: Delta One product comparison**

| Type of Security | Advantages | Considerations | Works best… | Explicit costs | Variable costs |
|---|---|---|---|---|---|
| Shares | Customization | Infrastructure | Small portfolios, | Commissions | Expensive infrastructure |
| "Do it yourself option" | Flexibility and control | Administrative Costs | Low turnover, | Bid / Offer spread | Share borrow costs |
| | | Trading desk | Infrastructure in place | | Tracking Error |
| Futures | Leverage | Roll risk (quarterly rolls) | High turnover | Commissions | Rolling (quarterly) |
| "The cheapest beta?" | Low commission | Limited exposure | Shorter duration | Bid / Offer spread | Dividend risk |
| | Liquidity (certain benchmarks) | Few benchmarks tracked | Trades popular benchmarks | | Tracking Error |
| | | | | | Funding/Interest rate risk |
| ETFs | Liquidity | Expense fees / Mgmt fees | High frequency trading | Commissions | Tracking error |
| "The hottest beta" | Ease of use | Tracking error | More granular exposure | Bid / Offer spreads Management fees | Dividend treatment (depend on ETF structure) |
| | Variety of offerings Multiple trading counterparts | No leverage | (than futures allow) | | |
| Swaps | Customization | OTC | Large portfolio | Commissions | Counterparty risk |
| "The customised beta" | Confidentiality | Counterparty risk | Longer term trades | Bid / Offer spreads | Cost of customization |
| | Leverage | Set-up documentation | Low anticipated turnover More customised exposure | Documentation | Funding / Interest rate risk |
| | Lower funding costs | | | Break fees | |

*Source: Credit Suisse*

# Electronic 'Algorithmic' Trading

**History**

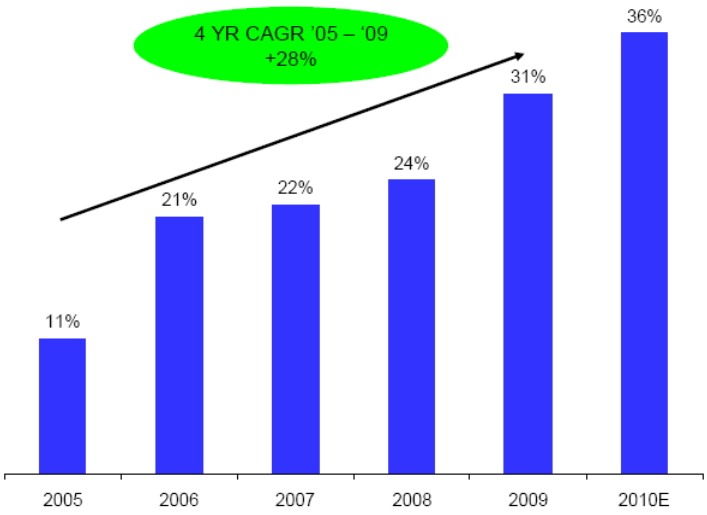
Over the last decade there has been a massive transformation in the market structure, volumes, and participants involved in the global equity markets. As exchanges around the world have demutualised, innovated, and been exposed to intense competition, spreads have narrowed and trading volumes have grown rapidly. At the forefront of this change has been technological innovation and this has, in turn, lead to the rapid adoption of electronic and automated trading.

Credit Suisse was the first firm, in 2001, to launch fully automated *algorithmic* trading strategies for clients – this service is called *Advanced Execution Services* (AES).

From its inception nearly a decade ago, the product suite has expanded dramatically to include multi award-winning algorithmic trading strategies, tools, and analytics for global trading across equities, options, futures and foreign exchange. The group now covers more than 40 markets on 6 continents.

The key difference for a client that decides to trade electronically is that they take ownership of the order, whereas traditionally this would be outsourced to traditional third parties.

**Figure 36: Percentage of order flow firms send to broker algorithms, 2005–10E**




*Source: TABB Group*

**The benefits of Algorithmic Trading**

- Anonymity and transparency.
- Improved productivity via fast response times to price moves, trading activity and liquidity opportunities.
- Control of the order (constantly being watched and monitored).
- Reduced costs – spread costs are reduced by luring out dark or hidden liquidity
- Improved execution results – tactics can be customised.
- Speed.

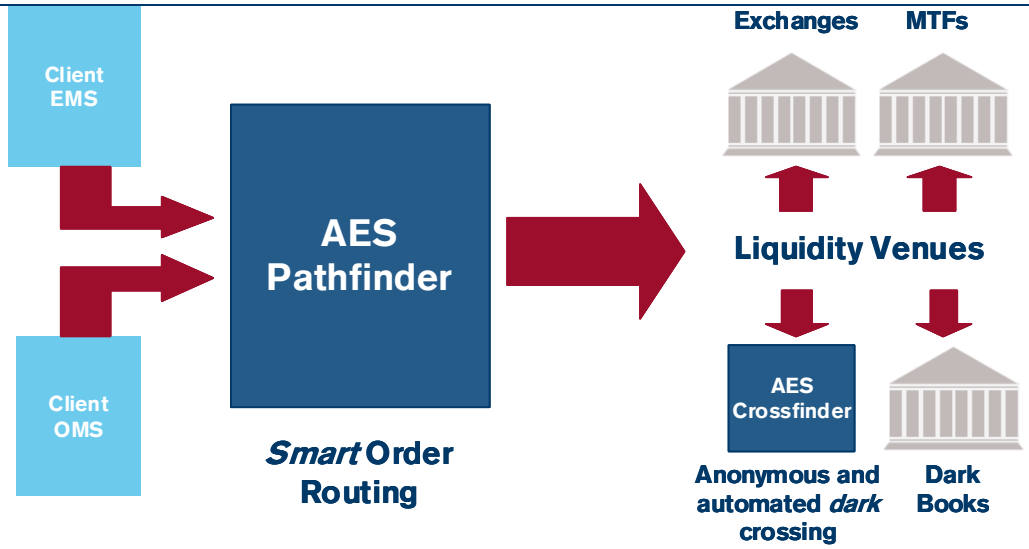
**The post-MiFID European Trading Landscape**

- More than 10 new trading venues have opened (with more to come).
- Some of these new trading venues will be dark, some visible and some co-mingled order-books.
- There is a mixture of 3rd party, exchange owned, broker owned and broker sponsored dark books.

**Intelligent Liquidity Sourcing**

This is an example of how AES routes a client's electronic order to multiple liquidity sources.

**Figure 37: The routing of electronic orders**




*Source: Credit Suisse*

However, finding liquidity is more easily said than done.

**Taking liquidity**

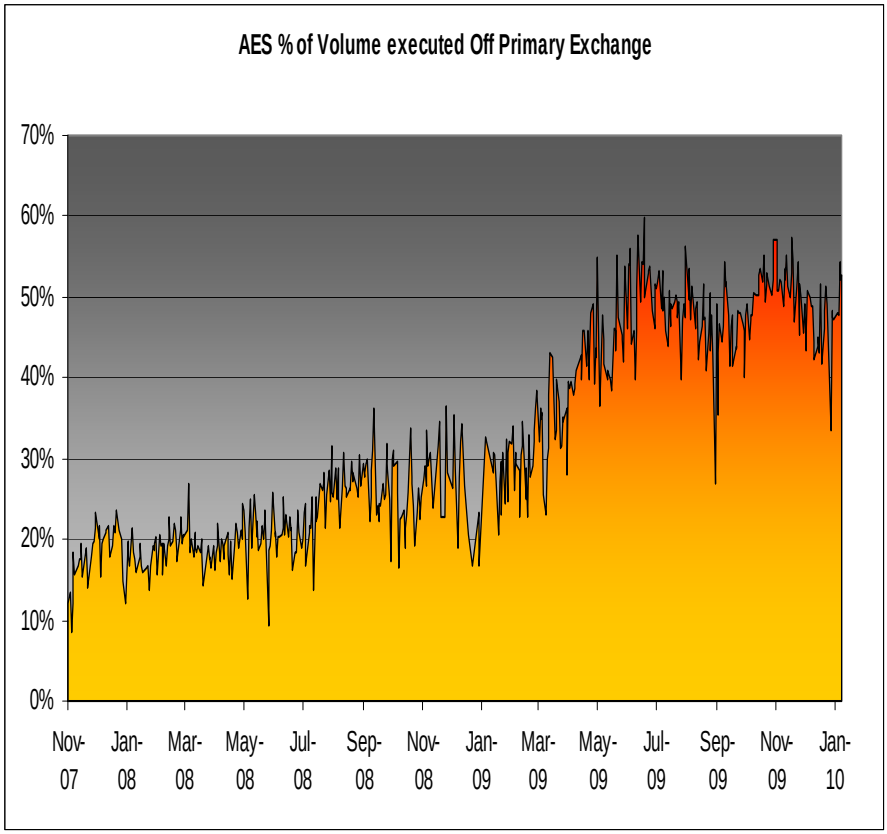
- This is a methodology to buy from visible sells and sell to visible buyers.
- Intelligent order probing across all venues
- Tick by tick order placement to extract price improvement inside the spread

**Providing liquidity**

- This is a methodology to show a willingness to sell at a given price or buy at a given price.
- Heat-mapping technology - updated road map showing where liquidity may reside
- Where did liquidity trade?
- How recent was the last print?
- How much volume went through?
- Dynamically redistribute orders when liquidity is found

**Algorithmic trading is an increasing proportion of European volumes**

**Figure 38: Proportion of AES business traded off primary exchange**




*Source: Credit Suisse*

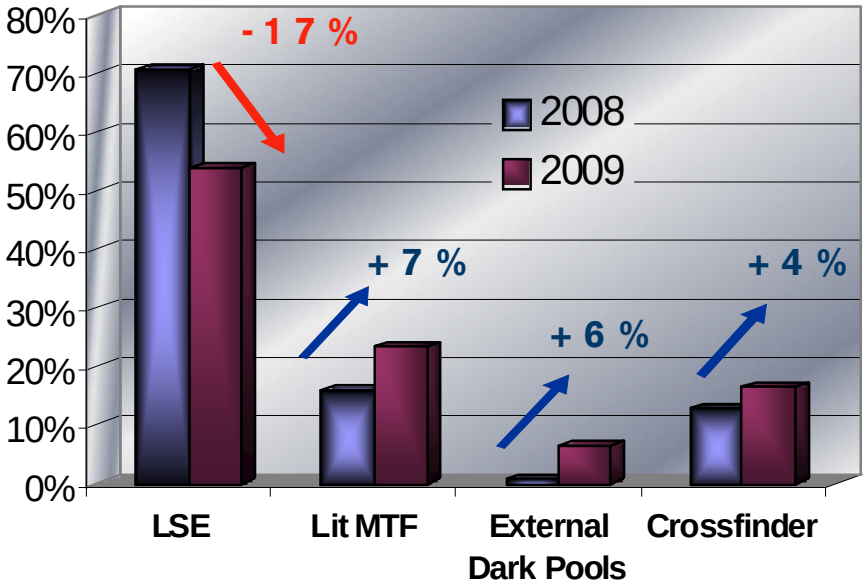
This is the proportion of trading by Credit Suisse's AES that is done outside of the traditional primary exchanges in Europe i.e. The London Stock Exchange, Deutsche Boerse, Euronext, etc.

**Types of liquidity**

Lit: Includes exchanges, MTFs, ECNs. Lit liquidity displays visible quotes and sizes which can be seen for price formation purposes on Bloomberg, Reuters, etc.

Dark: Broker internal flow (dark pools), Exchange and MTF dark books. It is non-displayed liquidity. Dark liquidity can only be seen after trading on the 'tapes' via Bloomberg, Reuters, etc. It is particularly helpful for trading blocks and reducing market signature.

**Figure 39: Growth in the accessing of non-traditional liquidity**




*Source: Credit Suisse*

This shows how orders were completed and the change in the type of venue over time where executions occurred.

In addition, the amount of volume that crosses 'naturally' has grown considerably. Circa 16% of all Credit Suisse flow now crosses off. The FSA believe that c4-5% now crosses electronically in the European market as a whole.

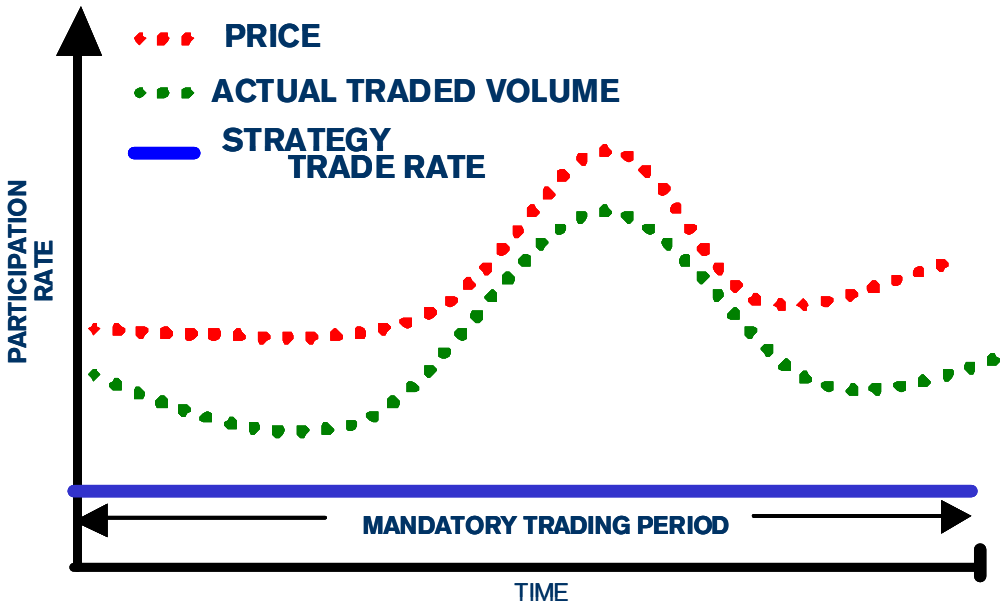
# The Algorithms – some examples

The following are a few examples of the many electronic trading strategies that can be adopted via AES.

**Regulated Algos**

**TWAP** (Time Weighted Average Price) where the objective is to spread the order evenly over the specified time.

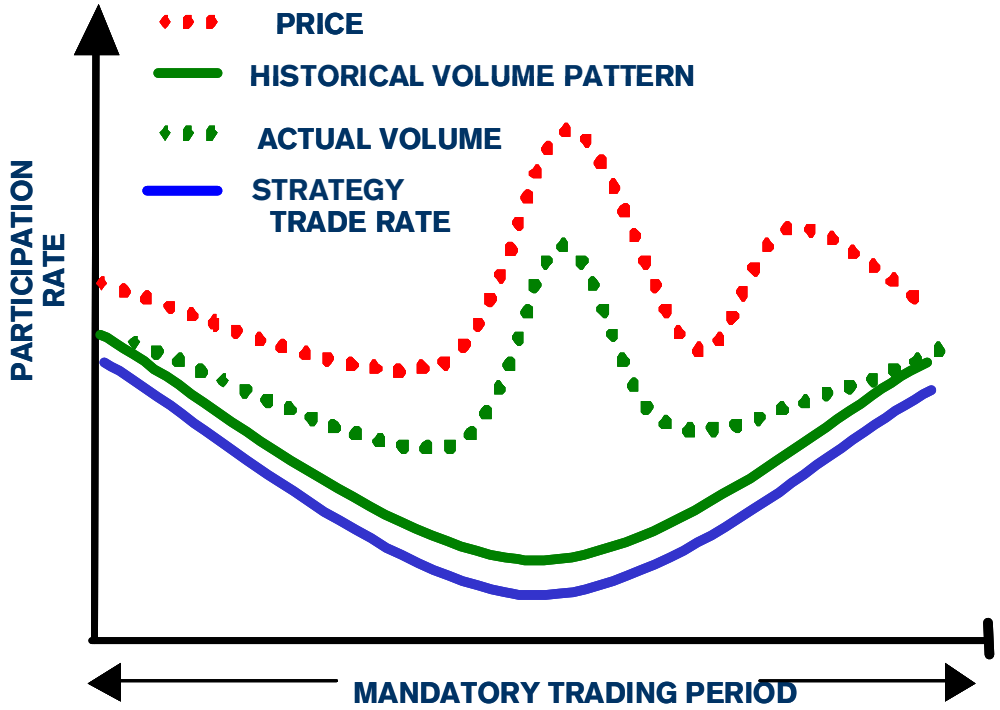
**Figure 40: Time Weighted Average Price**




*Source: Company data, Credit Suisse estimates*

**VWAP** (Volume Weighted Average Price) where the objective is to trade over a specified time period in-line with expected volume.

**Figure 41: Volume Weighted Average Price**

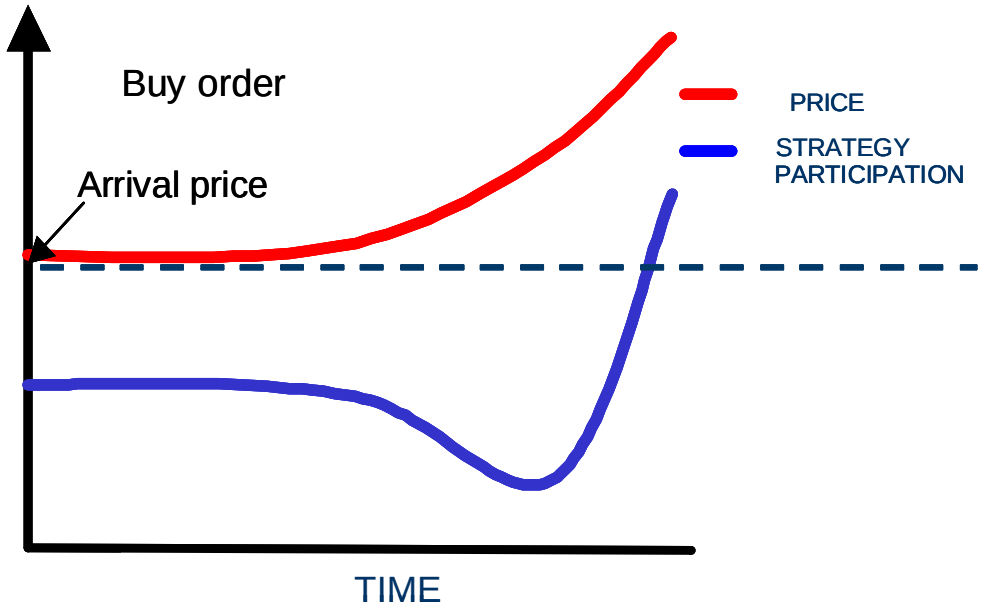



*Source: Company data, Credit Suisse estimates*

**Participation Algos**

**In line** – complete without impacting the price (using the arrival price as the benchmark).

**Figure 42: In-line algorithm**




*Source: Company data, Credit Suisse estimates*

**Opportunistic Algos**

Some of the more sophisticated strategies do not use pre-determined patterns to trade, but instead react to market data, volume and pricing to determine when best to trade.

The most widely used of these are **Guerrilla** and **Sniper**.

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