

Dow Jones - Do we understand it?

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Abstract

In a three step approach we set the stage to discuss a new species of long-term investment products. In essence these products will resemble index or unit-linked life insurance solutions which are already marketed today. However, capital protection will be achieved by classical rolling-forward insurance concepts rather than by means of hedging strategies. By their short-term nature the latter end up being cost-intensive when employed as insurance of long-term investment risk. Nonetheless, in order to avoid the impression of deliberate rip-off on behalf of financial institutions up-front, at least in the presence of a liquid underlying (some index or fonds), hedging strikes as being the only accepted means from a regulatory point of view to grant capital protection as of date. This is why some pioneering work is due first before making such concepts as discussed below accepted by regulators.

Keywords: CAPM, quasi risk-neutral valuation, risk-aversion, risk-neutral, leading indicator, upcrossing, downcrossing, long-term investment risk, capital protection, finite insurance, profit participation.

Remark: Concerning subproject 1 such as outlined in section 2.1 below, a one hour presentation bundled up with documentation upon technical details/methods and data sets used can be given upon request. As a side-product we will shed some light here on the popular belief that stocks outperform bonds long-term. Please direct your inquiry to info@niederau-research.

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1 Motivation and approach

This project eventually aims to discuss new products and their economics suitable for long term investments. Due to the demographic development in most developed industrial countries, social security systems to parent generations are more and more under challenge which is why private provision of old age (such as the “dritte Säule” in Switzerland) gains importance.

1.1 Historic flashback

In case of the traditional life insurance, the policy holder in essence invests in long-term government bonds and trusts in both the Risk Management capabilities and the policy of profit participation of the respective life insurer. With this concept of insurance, up to a scenario of bankruptcy of the insurer, the policy holder cannot lose money but returns may be limited depending upon the interest rate structure underlying the policy. Due to the assumption that in the long-run only an investment in stocks outperforms any bond-related investment strategy, classical life insurance products have been amended during the last decade in line with the principle of "greed and fear". So-called unit or index-linked life insurance policies would open doors to the policyholder to profit from ups in some underlying funds¹ or index² whilst a so-called capital protection makes sure that down-movements are capped from below. Depending on the risk-aversion of the policy holder the capital protection can take various shapes, but in any case it is supposed to make sure that the policy holder cannot fall much below her/his initial investment. In terms of product economics of the latter type of index linked life-insurance policies the component of capital protection is the crux. Various studies in essence confirm the obvious: the higher the protection level, the lower the return to investors³. The latter is particularly due to the fact that the issuers of such products achieve the guaranteed capital protection by means of hedging which is typically

- not long-term but, on the contrary, very much short-term related and is therefore
- transaction- and cost-intensive.

Albeit a regulatory requirement, in accumulation over time the latter may be detrimental to the returns of long-term investors.

The new family of products which will be discussed within this contribution still aims to link both ideas, i.e.

- the one underlying the classical endowment insurance on the one hand and
- the one trying to lock-in and stack-up profits from long-term gains of financial indices on the other hand

¹e.g. ETF's

²e.g. Down Jones, TecDax, or Nikkei

³cf. for instance an NZZ article (Nr. 299/20) under "Märket und Meinungen: Teuer erkaufte Sicherheit".

but achieves capital protection in a different way. In particular it will be engineered to achieve independence of costly short-term hedging strategies by means of a fall back on the traditional concept of finite insurance which grounds on the idea of balancing out downside risk over time. Before becoming operational and potentially accepted by regulators, the latter approach inevitably revives the question originally pursued by Black and Scholes (before they deviated into that concept which finally yielded the Nobel price in 1997), i.e. how to actuarially model a financial time series such as the Dow Jones which will be under consideration below.

1.2 Structure

In order to structure this undertaking of product development, we proceed in three subprojects, all of which relate to the Jones Industrial Average (DJIA for short), a motivation of which to follow in the next section:

1. in a first subproject we try to establish an understanding of the antagonism subject to growth factors underlying the DJIA on the one hand and those on behalf of US T-bonds on the other hand. In particular we scrutinize the belief that investments in stocks outperform other bond-related investment strategies long-term. Assuming that the Dow Jones is well diversified as to its “industry mix” we try to derive measures of risk-aversion and associated risk loadings to expected returns which will be of use to price the products to be developed in a later step;
2. in order to motivate insurance based solutions to capital protection, in a second subproject we will propose a probabilistic model designed to forecast/simulate possible paths of the Dow Jones on a prospective one-year horizon and finally;
3. in a third step we will open the discussion of finite insurance concepts blending classical life insurance products with the concept of profiting from long-term gains underlying the Dow Jones.

1.3 Why the Dow Jones Industrial Average?

It is clear that one could develop such ideas as alluded to above with any major financial index. However, the Dow Jones strikes us a particularly suitable choice for various reasons:

1. unlike a considerable proportion of S&P 500 companies, Dow companies are by nature large and mature industrial corporations which have a comparatively small potential of (further) growth. The latter is reflected in the fact that on average P/E ratios underlying

the S&P 500 (say 20 to 25 on a long-term average) are about 5-10 points higher than those of the DJIA (say 15 to 20 on a long-term average). The latter aspect makes returns of Dow companies best comparable to returns of T-bonds which is an important feature of the first subproject;

2. the Dow is unique in the sense that the returns of its component companies are not weighted by their respective market capitalization so that there is not this striking dominance as for instance in the SMI, where about four companies make up for about 80 percent of the whole market capitalization and drive the index accordingly;
3. compared to other indices, the Dow has a rather balanced representation of the various industries such as energy, food, industrial production, banking, trade, technology, transportation-automotive, and others. This industry mix makes the Dow fairly diversified and thus less biased towards isolated volatilities in particular sectors;
4. last but not least, as can be observed in recent times, the Dow still dominates the world's major indices. Although the first market contraction in early 2006 seemed to have been triggered in Far East, at that time the Dow was already in contraction since about a week before, just with small daily declines which were not much stressed by the financial media and therefore did not receive too much attention.

2 Preliminary results

The first subproject mentioned in section 1.2 above was conducted on a provisional basis by Dr. Niederau Consulting&Research in September 2007 and yielded the results sketched below. The account here was on conceptual issues rather than on ultimate accuracy relating to data and analytical methods employed: data were taken from public sources, such as from

- Yahoo or Google Finance,
- Hussman Funds,
- Dow Jones Indexes,
- and a few others mentioned in the text.

Smoothing techniques applied relate to discrete Fourier transforms which may be more effective when applied to denoised versions of the respective time series rather than to the original ones. The latter two aspects will be under revision in a second project phase including an extension of results to the end of 2007.

2.1 Preliminary results of subproject 1

Before summarizing various observations made, we introduce a few conventions and notations which make the understanding more straight forward. If not stated otherwise we assume that T-bonds (T-b for short) and inverse P/E ratios (E/P ratio for short) are smoothed. With a long-term perspective and the comfort to abstract from short-term hedging strategies, we are not interested in short-term noise or even ARCH (autoregressive conditional heteroscedasticity⁴) effects. T-bond rates per annum (p.a.) are taken as an annualized average over 10, 20 and 30 years in line with the average "life time" of a company in the Dow (cf. historical Dow component list). In regard of both relative and absolute index values of the Dow we will distinguish between nominal and normalized values. In contrast to nominal amounts, normalized values are corrected for inflation (see observation 1 below). A summary of the major observations of the first subproject with graphical illustrations in attached slide show are given next:

1. On a real, i.e. inflation-adjusted basis⁵, 1 \$ in 1962 is worth about 16 \$ in 2007. Realizing that, after all, the Dow represents a monetary value, this means that in order to compare the level of the Dow in 1962 with the one in 2007, we need to multiply the 1962 value by 16, otherwise we are comparing incomparables. On a normalized basis
 - the historical all-time high of the Dow was attained in year 2000 at around 15200 index points (see slide 1),
 - the Dow gains about 1% p.a. on a long-term average (see slide 8).
2. In view of smoothed components, T-b rates expel as a phase-shifted version of E/P ratios (see slide 4); the shift is around 1000 trading days on average, which is four years, roughly. In other words, the inverse P/E ratio today may be viewed as a leading indicator of the T-b rate level in about four years from now.
3. Points of intersection of the historic E/P ratio and the T-b rate graphs foreshadow turning points of the normalized Dow series (see slides 5 and 6), which looking back 40 years

⁴In words, this tongue-breaking expression just means that short-term market fluctuations (volatilities) are correlated, such as a sharp upward moving being followed by another one and vice versa for downward movements.

⁵Inflation is usually measured by means of an inflation rate or changes in consumer price indices and reflects the current level of inflation. However, in this project adjustment for inflation has been carried out with respect to smoothed rates of one-year US treasury bills rather than with annual inflation rates. In essence the difference between the two reflects the estimated risk of (further) inflation as compared to the current level. The latter difference may be considered negligible when the current level of inflation is on highs (such as in the 70's) but it should not be omitted when the current level of inflation is rather low but there is a substantial risk for increasing inflation short-term, a situation such as we are facing at present.

occurred last around 1962, around 1981, and eventually in the course of 2005. The latter upcrossing seems to foreshadow the current market contraction which took its start in early 2007. However, it occurs that turning points indicated by up- or downcrossings show up with a time lag of about 2-4 years. In the early 1960's markets still ran up for about another 4 years before reaching the peak in 1965 preceding a contraction which extended till the early 1980's. Likewise the turning point in 1981 was indicated by a downcrossing two years before. With respect to the current situation, despite the upcrossing in 2005, which indicates a forthcoming market contraction long-term, markets may still run up short-term.

4. Dow companies pay high dividends not when they doing well but when hurdle rates as indicated by returns of T-b's are highest, i.e. when the normalized Dow is on lows⁶.
5. With remarkable congruence the long-term nominal growth rate per annum averages out to 7.5% both for investments in the Dow and in T-b's over the last 40 years (see slide 7). However, care is needed in that dividend yields are not included in the Dow so that we need to add about 3.5% to the average Dow return of 7.5% to obtain 11% on total. There are two possible interpretations to these results. If investors are risk-neutral, i.e. if they only care about expected returns, then the 11% return of the Dow would indeed support the common sense assumption mentioned earlier that investments in stocks outperform investments in bonds long-term. If on the other hand market actors are risk-averse, such as assumed in the CAPM, the extra charge of 3.5% can just be interpreted as risk premium (in the sense of Pratt and Arrow) which makes risk-averse market actors indifferent of investing in Dow titans versus investing in T-b's. In this interpretation the 3.5% would not be an extra return surplus as compared to bonds but about a 25% standard deviation loading⁷ which compensates risk-aversers for their aversion against the high volatilities in Dow returns as compared to those of bonds (see slides 7, 8, and 9). In other words, if dividend yields are just risk premiums to compensate market actors for their aversion against volatility, investments in stocks and in T-bonds are just equivalent on the basis of risk-neutral valuation, i.e. abstracting from risk-aversion. More clarification of these opposing interpretations can be given upon request in a presentation as mentioned in the front matter of this document.

Further details and updates to follow.

⁶A historic chart of Dow dividend yields can be found for instance on "gold-eagle.com"

⁷Based on the present data the standard deviation of Dow returns was calculated at around 15%.