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# RISKS and REWARDS

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## It's Different This Time

***by Nino Boezio***

In the last few years we've heard that the old rules and paradigms of investment strategy and caution may no longer be applicable in today's financial environment, because things were "different this time." Some of the arguments included:

- Inflation is now subdued through global competition, which has kept labor market demands and product/commodity prices low.
- New production techniques such as just-in-time-inventory management have reduced the overall required amount and thus cost of capital.
- The globalization of the world economies has produced an environment in which poor economies can be supported by strong economies through floating exchange rates, thus improving overall trade. Globalization has also resulted in intense competition, resulting in lower product prices and lower inflation.
- World peace has promoted economic stability, facilitated by the fact that there is only one military superpower left (the U.S.).
- Capitalism is the undisputed best economic guiding force in financial affairs.

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## The Objective (Function) of Asset/Liability Management

***by David N. Becker***

Two paradigms have been identified for use in asset/liability management. These two paradigms differ in the choice of objective function and the framework for analysis; that is, one is a simulation of the firm as an external observer (for example, shareholder) would view it and the other is a "still life" at a given moment from an internal viewpoint. These two perspectives, clearly, are very different. It is useful and important for the user to understand exactly what each measures in order to apply it meaningfully. The two paradigms are referenced as "OAVDE analysis" and "market-value analysis" or "fair-value analysis."

### OAVDE Analysis

Let the company be a U.S. stock life insurance company. If the discussion is referencing a block of business, let the block be part of a U.S. stock life insurance company.

Be careful to distinguish between the viewpoint of the company, that is, internal view of the company, and the viewpoint of the shareholder of the company, which is external. The shareholder view is the only one that matters for this discussion.

"Cash" to the shareholder means free cash flows, that is, amounts of money that are available to be paid as shareholder dividends or used to fund new business. Cash that is received by the company (internally) but isn't *free* as described above (for any reason whatsoever) isn't "cash" from the shareholders' point of view. While free cash flows are "pretax" to the shareholder, the free cash flows are after income taxes and capital gains taxes have been paid at the company level.

From finance theory the intrinsic value (or fair value) of a security is the risk-adjusted present value of the security's free cash flows (Copeland and Weston).

Recall from finance theory (Copeland and Weston) that a dollar of shareholder dividend is equivalent to that dollar withheld and reinvested in new business if the new business earns the cost of capital of the company. So there is no loss of generality in assuming all free cash flows are paid as shareholder dividends. Price appreciation of a security derives from anticipation of higher future dividends from internal reinvestment of free cash flows

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in projects earning the cost of capital. Thus price appreciation is already reflected in the "cash only" stream of free cash flows.

It is a *fact* that in the U.S., some state regulations specify that a stock life insurance company may not pay a shareholder dividend greater than its statutory net income (SNI). Regulations also mandate various liabilities (policy reserves, deficiency reserves, interest maintenance reserves, asset valuation reserves) and a minimum level of required surplus, for example, risk-based capital (RBC) at the company action level. These regulations affect the amount of capital employed to support the company or block on which a return must be earned.

Prudent management, however, may decide to hold a higher level of RBC; for example, a scientifically determined RBC formula based on a statistical confidence level acceptable to management may indicate a higher level of RBC than the company action level. Additionally, the RBC target may be dictated by the desire to maintain a given NAIC RBC percentage, a given Best's rating, S&P rating, Moody's rating, or Duff & Phelps rating. However determined, the choice of the RBC level to be maintained is decided by prudent management.

***"It is a fact that in the U.S., some state regulations specify that a stock life insurance company may not pay a shareholder dividend greater than its statutory net income (SNI).***

Combining the regulatory constraint on shareholder dividends with a prudent RBC level results in a formula for free cash flows (FCF) for period *t* for a block of business in a U.S. stock life insurance company. This is:

$$FCF_t = SNI_t - \Delta_t (RBC).$$

The term *distributable earnings* is used to describe these free cash flows.

If a complete financial model of the block, that is, liabilities, supporting assets, statutory accounting rules and federal income tax requirements, policyholder behavior, borrower behavior, competitor behavior and company management behavior (interest crediting rate policy, other nonguaranteed element policy, reinvestment and disinvestment) is built, then this model coupled with a scenario of future yield curves allows one to project the distributable earnings that would emerge each period into the future for the block of business managed as prescribed. The present value of the periodic distributable earnings is referred to as the *discounted distributable earnings* for that scenario. If scenarios are generated in a stochastic manner with each scenario assigned a probability, then the probability weighted arithmetic average of the discounted distributable earnings by scenario is called the *option-adjusted value of distributable earnings* (OAVDE). OAVDE is the objective function to optimize.

OAVDE represents the intrinsic value or fair value of the "security" (block of business and supporting assets) whose free cash flows are the shareholder dividends that can be paid to the security's owner(s) after taking into account the exercise of embedded options in both the assets and liabilities over possible future interest rates.

It is important to note that this value is the result of a simulation of the overall management and resulting financial performance of the business into the future. It explicitly includes reinvestment and disinvestment decisions.

Is the limitation on free cash flows/distributable earnings imposed by regulation arbitrary? Yes. Is it real? Yes! Why? Because it does affect the availability of free cash flows to shareholders and it is the free cash flows to shareholders that determine the intrinsic or fair value of the security.

Does this have a legitimate meaning to a mutual company? Yes. The internal rate of return on distributable earnings represents the maximum growth rate of the mutual company that can be funded from internal sources.

How does this fit with regard to a publicly traded U.S. company that is a noninsurance company? In general, a publicly traded U.S. company is only affected by GAAP accounting. Under GAAP accounting it is possible for a company to have negative earnings, be borrowing money, and still be able to pay a shareholder dividend. (It may or may not be prudent to do so.) It is not even required that the company still have positive surplus after the shareholder dividend is paid as long as there remains a positive balance of "paid in capital." Therefore, under GAAP there is only the most modest limitation on paying shareholder dividends. Management discretion is virtually unlimited.

What about an otherwise similar life insurance company in another jurisdiction, for example, Canada? In this situation management would have to develop an agreed-upon choice of objective function. Such objective function would have to reflect the cost of capital that supports the business, all internal cash flows (including taxes), any limitations that the jurisdiction places on the payment of shareholder dividends, and a prudent release of capital. If the limitations are as loose as in U.S. GAAP, then management would have to determine a prudent basis upon which shareholder dividends would be paid and couple it with a prudent risk-based capital requirement.

But doesn't this mean that the value of an otherwise similar Canadian stock life insurance company could be different from the U.S. stock life insurance company? Yes. Why? Because the timing of the free cash flows to the shareholders of each company could be different. Is timing that relevant to this issue? Absolutely. Besides the direct negative impact of higher capital requirements, consider the fact that if, due to timing implications of these requirements, funds in the U.S. company must be paid out later, then the investment income earned by those funds while held internally to the company will be taxed at the company level. Only the after-tax income, which has a lower return than the company's cost of capital as these funds are invested in typical fixed income and equity securities, is then available to be paid to shareholders in the future. So there are real differences due to timing; and these differences are further affected by taxes

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internally to the company. This is why timing differences, capital requirements, and taxes at the insurance company level have a significant impact on the intrinsic or fair value of the company.

The validity of this approach is confirmed by the methodologies that arose during the 1980s from the merger/acquisition market. (For example, see the candidate readings from the Association for Investment Management and Research for CFA Level I and Level II exams.) These methods attempt to model the relevant aspects of the business and create an objective function that represents what the company can actually pay to the owners. It is true that the leveraged buyout (LBO) specialists tend to take a very aggressive view of what can be paid out. The price the prospective owner will pay reflects the aggressiveness of the objective function for shareholder dividends.

The cash flows that are important are the cash flows to shareholders, not the cash flows that are internal to the company, which may or may not be payable to shareholders at the time the company receives them or at all. Free cash flows, that is, distributable earnings, are the basis for economic value.

Using OAVDE as the objective function enables management to analyze the company's risk/return profile from period to period, to assess if the increase in return compensates them for additional risk and to identify superior strategies, that is, how better to manage the business (reinvest, disinvest, credit interest, and so on), from the perspective of optimizing value for shareholders. OAVDE can also be the foundation for an option-adjusted economic value-added accounting system.

An issue sometimes raised is the choice of a discount rate for OAVDE analysis. Since OAVDE represents the fair value of the security the discount rate chosen should be equal to the investors' return requirement. This could be a specific hurdle rate. Another choice is the cost of capital for the company. (The life insurance industry has had a stable cost of capital for some time. There is research by Ernst & Young, McKinsey & Co., and so on, on this topic.) For an acquisition, different choices of hurdle rate provide information to the user about the upper bound on what should be paid in order to ensure the desired return.

A constant discount rate (cost of capital or hurdle rate) can be used. Alternatively, one can express the rate as a spread-to-Treasuries. One method for estimating the spread is to use the CAPM to uncover an equity risk premium. Multifactor models, for example, using such variables as price/ earnings and price/book, can also be used. Expressing the return requirement in the form of a spread is preferable, because the use of a fixed rate can overstate or understate value depending on the interest rate paths.

When discounting the pathwise distributable earnings, one should use the classical discounting method only if there are no changes in algebraic sign in the distributable earnings. If there are, then the method developed in my paper "A Generalized Profits Released Model for the Measurement of Return on Investment for Life Insurance" [*Transactions*, Vol. XL (1988), Part I, pp. 61–114], should be used. The main result of this paper is really a theorem on capital budgeting. The paper uses the flat rate approach for presentation, but it is easily restated for the spread-to-Treasuries approach by substituting the risk free rate plus the spread in place of the flat rate. If this method is not used, then in certain cases the OAVDE value is overstated.

***"Using OAVDE as the objective function enables management to analyze the company's risk/ return profile from period to period, to assess if the increase in return compensates them for additional risk and to identify superior strategies, ..."***

## "Market Value Analysis" or "Fair Value Analysis"

The objective function under this approach is simply the "market" (that is, fair) value of existing assets (FVA) less the "market" (i.e., fair) value of existing liabilities (FVL) at the date of valuation. This is sometimes referred to as the "market value of surplus," "fair value of surplus" (FVS) or "economic surplus."

This objective function is a "pure-cash" definition and ignores any cost of capital. It represents cash from the internal view of the company, not the external or shareholder view of the company. This definition is pretax at the company level; that is, it does not reflect federal income taxes or taxes on realized capital gains and losses.

Similar to value-at-risk (VAR) measures, this objective function can be used to create a relative measure of risk, and it has limitations similar to those of VAR measures. But this objective function is not an adequate tool for determining risk/return profile (neither are VAR measures) or for identifying robust strategies for optimizing the value of the firm because it is an internal view of cash and not an external or shareholder view. Some problems with "fair value of liability" and its associated "fair value of surplus" are described below.

First, there are epistemological difficulties with the "fair value of liabilities." For fixed-income securities, option-pricing models are calibrated by using observable prices for known securities in the secondary market. This calibration is the spread-to-Treasuries that reproduces the market prices of the known securities. This spread can then be used with the option-pricing model to estimate the fair value of an security whose market value is unobservable but have cash flow characteristics similar to that of the security whose market value is observable.

There does not exist, however, a secondary market for insurance liabilities in the same manner as for assets. (Note: the buying/selling of blocks of insurance among insurance companies is *not* a secondary market for liabilities in the same sense as for assets. Insurance companies buy the liabilities plus the supporting assets in exchange for the stream of distributable earnings that will emerge over time.) No market, then no market values. So no unambiguous

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choice of spread. Therefore some arbitrary choice must be made.

The choices for spread include: zero spread; fixed positive spread; spread that reflects the debt rating and/or claims-paying ability/insurance financial strength rating of the company; option-adjusted spread of the supporting assets; and cost-of-funds spread, that is, the spread that discounts future liability cash flows to the initial net cash received at the inception of the block.

The above analysis indicates that FVL is a relative number at best. It can be used for period-to-period comparisons, but it doesn't have an absolute meaning. If the FVL is a relative number, then the option-adjusted duration of liabilities computed from it is also a relative number. The degree of relativity can be seen from considering the following example.

For a multibillion-dollar block of deferred annuities, the FVL was estimated by using option pricing techniques and applying different spreads from 0 to 250 basis points in 50-basis-point increments. This range of spreads reflects reasonable choices for spreads as identified above. The resulting FVLs were used to compute the duration of liabilities for the various choices of spread. The ratio of the longest resulting duration to the shortest was slightly over 7. This means, for example, if the shortest duration was 0.5, then the longest was 3.5! If one is managing interest rate risk by matching durations, then what value from 0.5 to 3.5 do you tell your investment professionals to use? Individuals using different choices for spread will invest differently, each believing that he/she is minimizing risk.

Second, what does matching durations have to do with optimizing the value to the shareholders? The answer is that it may or may not have anything to do with optimizing the value to shareholders. In my paper "The Value of the Firm: The Option Adjusted Value of Distributable Earnings" (in *The Fair Value of Insurance Liabilities*, edited by I.T. Vanderhoof and E.I. Altman, published by Klewer Academic Publisher, Norwell, Mass. 1998), I presented an example of how the wrong decision would be made in hedging a SPDA by using *FVL* and *FVS* instead of OAVDE. The problem is that the objective function inherent in $FVS = FVA - FVL$ is the wrong objective function for measuring the value of a firm. Therefore, using *FVS* as the objective function would optimize the value of the firm only by chance and could suboptimize the value of the firm.

Third, *FVL/FVS* analysis is not a simulation. *FVS* is a "snapshot" at a moment in time, that is, $FVS = FVA - FVL$. *FVA* is a "time 0" number. It is not a simulation. The assets and liabilities are computed on a stand-alone basis; the interaction of the asset cash flows and liability cash flows is ignored. Therefore, one does not need to know the strategy for reinvesting or disinvesting in order to compute *FVS*. To determine the free cash flows of the company, one must know the entirety of how the block/company will be managed into the future.

***"FVL when applied to universal life can produce very small, zero or negative durations of liabilities."***

A further limitation of *FVL/FVS* analysis not being a simulation is that it often leads to total reliance on some form of duration matching for investment strategy. In doing so, it fails to encompass the trade-off between risk and return, the costs of rebalancing and the fact that a simulation of future environments might uncover investment strategies more robust to ongoing changes in the economic environment. This occurs as duration matching reflects a single period frame of reference and not a multiperiod frame.

Fourth, *FVL/FVS* analysis is not robust with regard to products or product features. *FVL* seems to have theoretical problems when applied to pure risk products. For example, consider an ART policy with annual premiums adequate to compensate for benefits, acquisition costs, expenses, taxes, profit, etc. Under these circumstances $FVL < 0$. This is the result of treating future premiums as negative liability cash flows and suggests that the present value of renewal premiums should be considered as an asset.

*FVL*, when applied to universal life, can produce very small, zero or negative durations of liabilities. This issue makes it difficult to duration match assets and liabilities or even to explain why one would. The anomaly is often dismissed by stating that derivatives can have negative or small positive durations. That is not an explanation or justification.

*FVL/FVS* analysis has difficulties even when applied to investment-only products which have renewal premiums. Part of the ambiguity stems from the aforementioned issue of whether the renewal premiums are treated as reductions to liability cash flows or as asset cash flows. The very fact that this ambiguity exists suggests there is a fundamental problem.

If one assumes renewal premiums are reductions in liability outflows, then they are discounted at the liability spread. If renewal premiums are assumed to be asset cash flows, then at what spread should they be discounted? In the latter case an argument can be made that the spread should be zero because the premium flow is assumed with certainty to be received by the company (subject to policyholder behavior assumptions); after all, the liability outflows assume the premiums were made subject to the same policyholder behavior assumptions.

If the latter assumption is made, then a large part of the assets will be the present value of renewal premiums. In the early to middle years of such a product, the assets will be dominated by the renewal premium asset. If duration matching is used, then it might not be effective because the invested assets are the smaller part of the total assets whose duration will be most influenced by the renewal premium asset. If the renewal premium are offsets to liability outflows, then the duration of liabilities is reduced and problems similar to that for universal life or pure risk products occur. Again, duration matching becomes ambiguous.

The issue with renewal premiums may be reflective of the issue that

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*FVL/FVS* analysis is a "time 0" analysis. Renewal premiums, like reinvestment and disinvestment, are aspects of a total simulation.

It has been observed that *if* there were a true secondary market for liabilities, then market efficiency would force a convergence of the results of these two paradigms. But there is no true secondary market for liabilities, and it is highly uncertain that one would ever develop. (Please see Appendix C of the paper "The Value of the Firm: The Option Adjusted Value of Distributable Earnings" for a discussion on this.) Also, all the assumptions behind efficient markets would have to be reasonably true. It is instructive to carefully examine each of those assumptions for its validity for a secondary market, if one existed, and the impact on the convergence assertion between these two paradigms if each isn't valid. Such an examination shows the tenuousness of stretching the analogy between fixed- income securities and insurance liabilities too far.

It is unfortunate that these two paradigms have been referred to in the literature as the "actuarial appraisal method" (OAVDE) and the "option-pricing method" (FVL). Both of these methods can be implemented using option-pricing theory; they differ in the critical choice of objective function. This terminology confuses the real issue and introduces value-laden overtones.

This situation has even led to the attempt to embed the OAVDE approach within a market value context by expressing the discounted distributable earnings as the sum of the market value of required surplus, a tax-adjusted "market value of assets less liabilities" plus a tax adjustment. The more complete expressions of this approach have epistemological and mathematical difficulties. But putting aside these issues, there is the fact that the approach redefines the "market value of liabilities" to include the distributable earnings via a "cost of capital" variable, which redefinition is not consistent with the fair value of liabilities paradigm. The result, even if all the epistemological issues and mathematics could be successfully resolved, then becomes the assertion that the discounted distributable earnings equal the discounted distributable earnings. This may further obscure the issues.

In contrast, OAVDE focuses on external or free cash flows; thus it is a measure of the value of the firm enabling the assessment of risk *and* return and their trade-off. OAVDE analysis is a simulation, thus facilitating the identification of robust strategies. OAVDE analysis can be comprehensively and meaningfully applied to all products and all product features.

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# *Call for Papers: "Risks in Investment Accumulation Products of Financial Institutions"*

The creation and issuing of new forms of contract structure by financial institutions, containing various guarantees relating to the investment performance of some blocks of assets, raise many new challenges for management. The design of these new structures, which include "variable" and "indexed" products, was intended to insulate financial institutions from most market risks. However, embedded guarantees and product features may engender some form of residual risk. The guarantees provided are linked to interest rate returns and/or equity returns. The techniques for managing interest-sensitive liabilities require expansion to provide the basis for stronger management of these new complex products.

In light of the dramatic need to more thoroughly understand the risks in investment accumulation products, the Actuarial Foundation and Nationwide Financial Services are jointly sponsoring a call for papers. Submissions will be reviewed by a panel chaired by Irwin T. Vanderhoof, The Stern School of Business, New York University. The Actuarial Foundation intends to present the accepted papers at a public symposium and to publish in a symposium proceedings.

The deadline for submission of papers is September 1, 1998. The detailed call for papers can be downloaded from the Research section of The Foundation's web site (www.soa.org/foundation), or contact Joyce Lewis at The Actuarial Foundation for more information, phone 847–706–3535, fax 847–706–3599 e-mail jlewis@soa.org.