Acquisition Valuation of P&C Insurance Companies

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Abstract

This paper presents a general approach and specific aspects of the valuation of P/C Insurers. It combines corporate finance, the economics of P/C Insurers, and actuarial versus financial views. Although the primary purpose of the paper is to investigate the acquisition valuation of P/C Insurers, its conclusions are applicable to other areas as well.

We discuss strategic aspects such as the purpose of valuation, motivation for acquisitions, status quo valuation, valuation of synergy, valuation of control, valuation of embedded (real) options, and so forth.

We introduce the main valuation methods and their applications to the P/C Insurance Industry. We develop the application of the EVA-based valuation approach. We examine the accounting versus the economic approach, the determination of Net Asset Value, Cost of Capital, cash flow projection, scenario testing versus stochastic analysis, the inputs of cash flow modeling, sensitivity analysis, the valuation of embedded options, and so on. A special focus will be limitations of the valuation, including critical analysis of key assumptions.

The appendix includes a case study of the acquisition of a P/C insurer from the Central / Eastern European region (CEE). Practical aspects of experience with the CEE are presented.

Content

1. Introduction

The assessment of the value of P/C Insurance Companies represents one of the traditional tasks of actuaries. The subjects interested in this issue range from investors, through company management to regulatory bodies and rating agencies. The particular interests of any of those parties determine the respective valuation objective. The valuation might be performed due to M&A purpose, internally as a base for an adequate risk and financial management or as a financial assessment executed by regulators and rating agencies.

This paper presents a general approach and specific aspects of the valuation of P/C Insurers. It combines corporate finance, the economics of P/C Insurers, and actuarial versus financial views. The paper balances the theoretical and practical aspects. Although the primary purpose of the paper is to investigate the acquisition valuation of P/C Insurers, its conclusions are applicable to other areas as well.

We are not restricted to a precise and complex valuation model with all possible actuarial and financial inputs. The success of a valuation model is not determined by its complexity. Valuation should be based primarily on the investor's point of view. Logic and a manager's intuition play a substantial role. Decomposition of an acquisition price may make it more acceptable. The application of other valuation methods is beneficial to confirm acquisition price.

The first section contains key features of the economics of P/C Insurers with respect to relevance and implications for valuation. In the next section, we distinguish between strategic and actuarial/financial aspects. Here, we discuss strategic aspects such as the purpose of valuation, motivation for acquisitions, status quo valuation, valuation of synergy, valuation of control, valuation of embedded (real) options, and so forth. Thirdly, we describe valuation methods of Corporate Finance and its application to P/C Insurance.

The core of the paper, Section 5.2, shifts to the actuarial and financial aspects of the valuation process. We examine the application of an EVA-based valuation to P/C Insurers, the accounting versus the economic approach, the determination of Net Asset Value, Cost of Capital, cash flow projection, scenario testing versus stochastic analysis, the inputs of cash flow modeling, sensitivity analysis, the valuation of embedded options, and so on.

A special focus will be limitations of the valuation, including critical analysis of key assumptions. Identification of key value drivers in the actuarial and financial assumptions and a detailed sensitivity analysis are necessary. Scenario testing is used in cash flow projections because of a possible information deficit of parameters.

The appendix includes a case study of the acquisition of a P/C insurer from the Central / Eastern European region (CEE). Practical aspects of experience with the CEE are presented.

2. Economics of P/C Insurance and Consequences for Valuation

In this section, we recall key theoretical fundamentals for the basis of P/C insurance. We highlight significant principles for the basis of the P/C valuation.

The common features of financial institutions may be seen in the mix of asset and risk transformation. We make the following hypothesis based on the specific nature of risk and asset transformation. The financial institution's mix of business and its position in the economy should be clearly identified and reflected in the valuation.

Does this hypothesis mean that the valuation of P/C insurers and financial institutions are based on different principles than those applied to non-financial institutions? Insurers, as financial intermediaries, play a substantial role in market economies. There is no substantial difference between P/C insurance companies and non-financial firms with respect to ownership. The majority of P/C insurers operate as joint-stock companies. This fact determines the objective from the investor's point of view. According to the traditional microeconomic approach, both P/C insurers and other non-financial firms run their business with the objective of maximizing shareholder value.

This starting assumption implies that the P/C valuation should be based on general valuation principles developed in corporate finance[1]. This requirement is in line with the investor's point of view. We discuss the implication in Section 4. The next step takes the specifics of the insurer into consideration, with respect to their role in the economy and the nature of the insurance business. We do this in order to correctly apply valuation principles.

We identify specifics of the P/C insurance industry with substantial consequences for valuation.

1) **The stochastic nature of the insurance process**
   Key stochastic variables include number of claims, claim amounts, claims occurrence, and payoff patterns. The valuation model should take this uncertainty into account. For actuarial applications, stochastic analysis or deterministic scenario testing and sensitivity analysis may be used.

2) **The long-term nature of the insurance business**
   This aspect is closely related to the previous one. The time horizon of cash outflow to settle incurred claim events can range from months to decades. Actuaries cannot rely exceptionally on accounting statements, which by definition represent a short-term and retrospective point of view. The valuation of P/C insurers should take a prospective and long-term view.

3) **The specific structure of the insurer's assets and liabilities**

[1] The valuation principles are the same whatever company is concerned. See Damodaran A.: The dark side of valuation: valuing old tech, new tech, and new economy companies; Prentice Hall.; 2001, p. 454: "Three fundamentals determine the value of a business: a firm's capacity to generate cash flow from existing investments, the expected growth in these cash flows over time, and the uncertainty whether or not cash flow will be generated in the first place."

The specific structure of insurance assets and liabilities with respect to maturity, degree of risk, uncertainty, and liquidity are of key importance for both NAV determination and cash flow projection

4) **Market imperfections**
   Market imperfections lead to an understanding of the information asymmetry between the insurer and its clients, the existence of moral hazard, adverse selection, and the negative consequences of bankruptcy. All of these items justify the existence of state regulation.

5) **State regulation**
   The statutory solvency requirements must be fully reflected in the valuation process. An example is seen in adjustments to NAV determination.

6) **Rating Agencies**
   Appraisals and reports performed by rating agencies have a substantial influence on how investors and the general public view the company. The agencies are a source of information for the valuation process, mainly in appreciating the adequacy of the acquisition price.

7) **Dependence on the legal environment**
   Besides the economic aspects of risk transfer, any insurance contract involves legal aspects as well. The long-term nature of insurance is substantially affected by certain long-term liabilities such as products liability and environmental claims. Future judicial decisions should be considered in the stress testing the valuation model.

8) **Dependence on macroeconomic development**
   The greater the time delay inherent in the insurance process, the more sensitive the company's results on key macroeconomic variables such as inflation, interest rates, GDP growth, stock market developments, and so on. Sensitivity testing is used to model various scenarios of future economic development. Stress testing models extreme cases.

To summarize, the long-term nature of insurance, its stochastic character, information asymmetry, the close connection to macroeconomic developments, and dependency on state regulation introduce a substantial amount of uncertainty and complexity to the valuation. We stress that a long-term prospective approach must balance the inputs from accounting statements, which represent a short-term view. An economic approach balances the actuarial and financial tools. Neglecting any of these points in the valuation may lead to misleading assumptions with a substantial impact on decision making.

3. The Acquisition Valuation Process of a P/C Insurer

3.1. Strategic Issues

In this section, we briefly describe the theory of the strategic aspects of the acquisition valuation.
Certain strategic issues should be addressed before starting the valuation modeling. Factors such as motivation, expectation, restrictions, and psychological fears are more qualitative than quantitative. They are difficult to quantify but are at least implicitly considered in the model. The valuation process consists of two interconnected parts:

1. **Strategic**
   It is the task of a manager to analyze the motives of an acquisition, possible synergy and diversification, control issues, improvement of operational efficiencies by managerial know-how via restructuring of an acquired firm, and the consideration of other strategic options. In this respect, actuaries and financial analysts are dependant on subjective managerial input.

2. **Actuarial / financial**
   The valuation task is delegated to actuaries and financial analysts once the necessary strategic issues are analyzed. The correct valuation model is based on the managerial assumptions and inputs of the strategy.

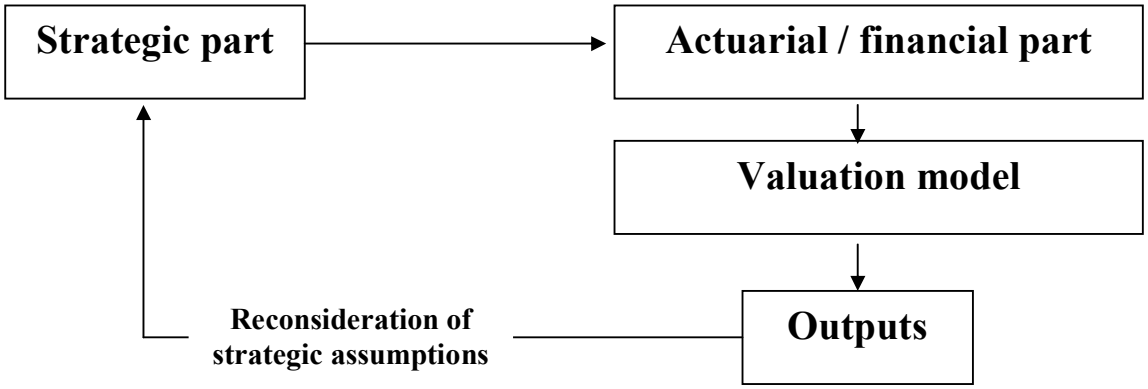

Figure 1: Valuation process of P/C Insurers

The strategic issues below are a simplified summary of ways in which actuaries and financial analysts depend on decision-makers.

- Motives for an acquisition
- Expected short, middle, and long-term impact on growth (sales, cross-selling) and profitability (economies of scale)
- Risks connected with the acquisition
- Other expectations and aspects of the acquisition

3.2. Motivation for an Acquisition

We distinguish the following basic motives for acquisition of a P/C Insurer, based on Damoradan's classification[2].

1. **Excess Capital of Acquiring Firms**
   The positive developments of the stock markets at the end of the 1990's boosted the capital of many insurance companies and led to capital in excess of the economically needed levels. Managers, trying to find adequate investment opportunities, have launched a wave of M&A activities. If excess capital were the only motivation, the acquisition would be very risky as the inputs may be significantly overestimated. Excess capital as a motivation is primarily determined by the demand-side, which may automatically push the acquisition price to inadequate levels.

2. **Undervaluation of Target Firms**
   The presumption here is the ability of the acquiring company to recognize that firms are undervalued by financial markets. Such ability suggests access to better information than is available to other investors in the market. We note that acceptance of this motive denies the validity of the efficient market hypothesis. This acquisition motive suggests a speculative investment, making a profit from the disparity in purchase price and sales price rather than a strategy.

3. **Synergy**
   Synergy is defined as the positive value-added by combining two firms. Many managers consider synergy as the primary motive for M&A activities. Although it is a popular justification, many studies have shown that synergy effects often overestimate the valuation. We should carefully analyze the extent to which synergy effects are adequate as inputs to the model. Traditionally, positive synergy effects are distinguished by economies of scale (lower relative costs) and growth synergy (higher growth) in the following areas:
   - Distribution (cross-selling opportunities, E-business, tied agency networks)
   - Operations (the company's infrastructure, IT-infrastructure, managerial know-how)
   - Underwriting and claims settlement (expertise, good reputation)
   - Asset management (know-how)

4. **Diversification**
   Diversification[3] reduces the volatility of the company's earnings. Together with synergy effects, diversification is often mentioned as a leading motive for acquisition. The quantification of diversification can be very questionable. Nevertheless, we identify areas where diversification benefits may be found:

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[2] See Damoradan A.: Investment Valuation: Tools and Techniques for Determining the Value of Any Asset; John Wiley and Sons, Inc.; 2002.

[3] Traditionally, there is a discussion in the financial theory and practice as to whether the diversification effects on the companies' level are negligible or not. According to the financial theory based on the hypothesis of efficient markets without any transaction costs, the diversification reduces only the company-specific risks, which can be diversified by investors creating diversified investments portfolios. Based on this, it would mean that the contributions resulting from the diversification should not be rewarded and therefore valued on the company's level in the acquisition process.

- Extension of an existing product offer
- Sound portfolio structure (e.g. property vs. liability products, reducing exposure in auto business)
- Extending the base of existing clients
- Creation of larger, homogenous portfolios
- Cross-industry acquisition (other financial institutions such as life insurers or asset management firms)
- Territory diversification (cross-border transactions)

5. Effects of Control

The effects of control include positive value-added from the restructuring of poorly managed firms. If there are easily identifiable operational deficiencies in the target company which can be improved in the short-term or middle-term future, they should be considered in the valuation.

6. Managerial Self-Interest

Besides the economic factors, there are psychological aspects stemming from the manager's incentive to increase personal power.

7. Tax Considerations

Tax considerations may be seen as a special case of synergy if the combined firm pays less tax than the separate firms would pay. As an example, a profitable firm may acquire a firm with tax deductible losses.

8. Increased Market Power

Market power depends on the concentration and competitiveness of the insurance market. The higher the market power, the higher the possibility of influencing market developments such as price.

9. Regulation

The acquisition may allow the combined firm to better meet statutory solvency requirements. This may be the case when a well-capitalized company acquires a weaker company.

10. Embedded Options

The initial acquisition investment may include the option of future investments. The initial investment is the necessary condition for exercising the option. Examples include expansion, entering new markets, or the sale of new products. Section 4.6 addresses real (embedded) options in more detail.

A clear message should be that the methodology and results of valuation modeling depend critically on an analysis of acquisition motives. In practice, there is a combination of motives. The analysis of motivation may capture other strategic issues. Excluding an analysis of motivation from the overall valuation analysis may result in misleading valuation assumptions.

3.3. Decomposition of the Valuation Process

We may analyze the motives of an acquisition once they are identified. Appropriate conclusions are made regarding the quantification of strategic valuation inputs and their incorporation into the model. Appropriate questions may be:

- When to consider the effects of synergy
- How to evaluate synergy
- Risks inherent in synergy valuation
- Who should pay for the positive added-value of synergy
- What portion of the total acquisition price is the synergy premium
- What are the assumptions underlying synergy premium

Similar questions may be asked for diversification, control effects, and real (embedded) options.

Damodaran's classification (see (7)) suggests the following decomposition of the valuation process to make the price determination transparent.

The value of a company $V = V_{SQ} + CP + SP + EO$

1. **Status Quo Valuation (V_{SQ})**

   The target company is valued according to current financial, actuarial, and business inputs as well as managerial know-how. In other words, we suppose there is no change in the company's operations. This first step provides a base from which the control and synergy premium is estimated. The variable V_{SQ} is the value of a company based on Status Quo Valuation. If the investment is speculative and the motive is undervaluation, V_{SQ} is the maximum price to be paid.

2. **Valuation of Control Premium (CP)**

   The value of control premium is the difference between the value of an optimally managed firm and the value resulting from Status Quo Valuation:

   Control Premium (CP) = Value of an optimally managed firm – V_{SQ}

   CP results from the right of the acquiring firm to take necessary steps in restructuring to improve the target company's operational efficiency. If the acquisition motive is control, the acquiring company should be willing to pay the value of control premium.

3. **Valuation of Synergy Premium (SP)**

   SP represents the positive added-value from combining two firms and includes diversification premium. Theoretically, synergy premium (SP) is calculated as:

   Synergy Premium (SP) = Value of the combined firms – Value of the target firm – Value of the Acquiring Firm

   SP is based on the presumption that the value of the combined firms is greater than the sum of the values of the acquiring firm and target firm operating independently:

   $V(A+B) > V(A) + V(B)$

The acquiring company's flexibility in reaching the desired positive synergy effects determines the willingness to pay the synergy premium. The acquiring company is less willing to pay the premium if it sees many possible targets affording the required synergy effect. In other words, the more flexibility you have, the less you need to pay. Note that it is also possible to reach the desired synergy effect by internal (organic) growth. The acquiring firm is not restricted to the acquisition of established entities.

4. Valuation of Embedded Options (EO)

The value of options to expand initial investments via new markets or new products, to postpone expansion, or to abandon projects should be taken into consideration. Traditional discounted cash flow models do not consider the value of options which are often embedded in investments. Section 4.6 discusses the valuation of real (embedded) options in further detail.

In general, there are two possible ways to consider the value of control / synergy / diversification effects and real (embedded) options in the valuation process. The easier way is an implicit inclusion of underwriting, financial, operational, and other business inputs. The second way is to exclude these effects and model them separately as outlined above. An explicit treatment enables us to better understand the impact of particular valuation assumptions and to analyze the adequacy of control / synergy / diversification weights on acquisition price. We may view explicit treatment as a more transparent and a safer way to review assumptions. However, we must be aware of certain difficulties. The decomposition approach may incorporate some inputs more than once. Its usefulness depends critically on the analyst's ability to explicitly define inputs for each step of the proposed valuation process, without creating uncertainty by implementing speculative inputs.

3.4. Summary

Any valuation is, to a certain extent, a subjective task. Strategic inputs, which describe soft terms such as expectations, are the subjective factors. For this reason, the valuation study should emphasize all key strategic assumptions and their corresponding implications.

The following are key outputs of the strategic process which must be provided to actuaries and financial analysts.

- Expected growth rates for each product line
- Improvements to operations (cost cuttings)
- Necessary investments for the operations
- Cross-selling opportunities
- Synergy / diversification effects
- Growth synergy
- Economies of scale
- Embedded options in the acquisition

Strategic inputs are critically influenced by the particular time period over which the valuation occurs. We strongly recommend not considering the inputs as fixed because of this time

dependence. The preparation of several scenarios or sensitivity analysis of key strategic inputs provides feedback to the decision makers.

4. Valuation Methods and Applications to the P/C Insurance Industry

4.1. Introduction

In this section, we introduce the main theoretical approaches to the valuation of companies. The valuation methods are very well known, see Damodaran (7). We discuss underlying principles in order to apply them correctly. We discuss specifics in the application to P/C Insurance, including advantages and disadvantages of each method. An overview is justified in that an analyst does not rely solely on one method when valuing a company. Other approaches are taken into consideration to confirm the range of possible outcomes and to check the correctness of the valuation assumptions.

The value of a company is defined as the difference between the value of its assets and the value of its liabilities. Two basic questions arise.

1. Identification of the terms of the assets and liabilities
2. Assigning values to particular assets and liabilities

The identification task is to recognize all assets and liabilities. Assets represent future economic benefits resulting in cash inflows, while liabilities represent future economic burdens resulting in cash outflows. A portfolio of assets ranges from tangibles, such as buildings and equipment to intangibles, such as goodwill, strategy, business opportunities, and employees. Questions to be asked are:

- Which assets should be included in the valuation?
- How should intangible assets, such as the firm's ability to generate future profits (goodwill) be reflected?
- Does flexibility in decision-making and other business opportunities (real options) constitute an asset? If so, which conditions must be fulfilled prior to inclusion?
- When should a liability be recognized?
- How should a potential risk (liability) be recognized?
- Which leading principles should be followed in the identification of assets and liabilities?
- How should a conservative approach balance a probabilistic approach?

One sees that the basic framework of the identification task is crucial. Substantial uncertainty can arise from the identification process itself. The second task then consists in assigning appropriate values to all assets and liabilities.

There are many approaches to both tasks. The various approaches, the valuation methods, are determined by underlying principles in identifying and valuing assets and liabilities. We follow corporate financial theory to distinguish the following basic valuation methods.

- Book value approach
- Stock market approach
- Relative valuation
- Discounted cash flow approach (DCF)
- Option-pricing theory

To create a general framework, we recognize certain criteria by which we classify the valuation methods.
Any valuation approach applies these classification criteria to various extents.

1. Prospective vs. retrospective approach
   Some valuation methods, such as DCF, are based exclusively on the prospective valuation. A retrospective valuation, such as the book value approach, follows primarily from past events.

2. The source and character of the inputs
   Either the objective or the subjective character of the valuation predominates. The former utilizes publicly available data from accounting statements (book value approach) or the stock markets (stock market approach). On the other hand, cash flow projection (DCF) is based predominantly on analysts' subjective assumptions about uncertain future.

3. Accounting vs. an economic approach
   This aspect is closely related to the source and character of the inputs. The valuation methods and applications vary to the extent that they follow the accounting or the economic approach.

4. Underlying theory
   Another distinctive criterion is the analyst's degree of dependence on a particular financial theory. We may follow a theory in its strict form, such as the efficient market hypothesis or stock market approach. We may also include rules of thumb such as P/E ratios. There is always a particular financial theory underlying a valuation model. How rigorously it is applied depends on the analyst.

In the following sections, we introduce the principles of methodologies, modified forms of which are widely used in practice. The intention is not to provide an extensive coverage of the field. We emphasize the applicability and limitations of each method and related issues to be taken into consideration. We focus on the application to P/C Insurance.

4.2. Book Value Approach

The book value approach is the most straightforward of the methods. Accounting statements are analyzed and adjustments are made to better reflect the market environment. The value of the company is derived by deducting the value of the liabilities from the value of the assets.

Value = Value of assets – Value of Liabilities

The issue is how to value the particular items of assets and liabilities. It is advisable to make relevant market revaluations since an exclusive reliance on accounting prices does not give an adequate picture. In concrete terms with respect to P/C Insurers, it means paying special attention to the following items. We present more detail in the discussion of accounting principles vs. economic approach of Section 5.2.1.

- Financial investments (book vs. market values)
- Goodwill (value of future business)

- Treatment of deferred acquisition costs (DAC)
- Exclusion of assets which have no connection to future business
- Receivables from reinsurance and direct insurance
- Claims reserves (reserve adequacy, reserve discounting)
- Unearned premium reserve (premium deficiencies)
- Treatment of equalization and catastrophe reserves
- Tax considerations (taxes, deferred taxes)
- Other market adjustments (cleaning of the balance sheet)

The pros and cons of the book value approach with respect to P/C Insurance are summarized as follows:

(+) Simplicity, clarity, transparency
(+) Few assumptions as to future uncertainty are needed
(-) Primarily based on accounting assumptions
(-) A retrospective approach contradicts the long-term nature of the P/C insurance business and the investors' point of view
(-) Accounting prices may not reflect a current market environment
(-) It may not consider the value of future profits and other intangible assets

We find the largest disadvantage of the book value approach, with respect to the valuation of P/C insurers, to be the focus on accounting statements as the primary source of information. The book value approach is a static and retrospective approach. It contradicts the long-term nature of the P/C insurance business and the investors' point of view. Market adjustments to relevant insurance assets and liabilities are a possible solution to this drawback. Another disadvantage is that values of certain intangible assets, such as the value of future business, business opportunities, and strategic options are not considered. There is a risk that these assets may not be captured properly.

Despite these objections, the book value approach is widely utilized in practice and occupies a more or less important place in any acquisition study. We note that the principles of the approach are a basis for the determination of NAV and are the first component of an EVA-based valuation methodology.

4.3. Stock Market Approach (Efficient Market Hypothesis)

According to the stock market approach, the value of a company is determined by the price at which its shares are being traded.

Value = Number of shares * share price

The number of shares is immediately available if we neglect special cases such as stock market programs for managers or employees. Problems can occur with the appropriate selection of share price. Should we utilize the current price or an average? What should the time horizon be for an average price? Analysts often prefer an average price over several months. There is no particular rule. It depends on the particular situation.

The application of a stock market approach is the simplest approach. It has a very strong theoretical background, the efficient market hypothesis. It implicitly assumes that the markets are efficient and that market price represents an unbiased estimate of true value. The

pioneering work in this field was performed by E.F. Fama (15). The theory is based on many restrictive assumptions distinguishing strong, semi-strong, and weak forms of market efficiency but has far-reaching consequences for valuation. In an efficient market, the expected return from any investment will be consistent in the long-term with the associated risk of that investment. The extent to which we accept the validity of an efficient market hypothesis will influence several steps of our valuation (e.g. determination of terminal value and projected ROE vs. CoC).

The strict underlying assumptions of the hypothesis suggest there are risks inherent in the application of the method. Firstly, we must carefully analyze to what extent the assumptions are fulfilled. Are the markets really efficient? If not, to what extent can we rely on the information provided by a stock exchange? We must consider how share prices are determined and which factors influence the price-determination process. Several psychological effects lead to over-valued or under-valued shares.

The analysis of adequate share price represents a substantial part of investors' decision making. Recent developments in the stock markets show that there is a tendency to substantially overestimate the valuation inputs at "good times" and underestimate the inputs at "bad times". However, the phenomenon of over- / under-valuation is not a concern limited to the application of a stock market approach to valuation. If investors' expectations are too optimistic or pessimistic, it will probably influence the assumptions of other valuation methods as well. Nevertheless, what matters is that ex-ante analysis of share price adequacy be a key objective when utilizing the stock market approach.

The pros and cons of the stock market approach are summarized as follows:

(+) It is the simplest approach
(+) Objectivity in the application of publicly available inputs
(+) No valuation assumptions are needed, other than validity of the efficient market hypothesis
(-) It relies exclusively on the efficient market hypothesis
(-) The strong assumptions of the efficient market hypothesis are not fulfilled in practice
(-) The share price may not reflect the company's long-term perspective
(-) Uncertainty as to how share prices are determined
(-) Related issues of under- / over-valuation of share price

The share price alone is rarely an adequate basis for valuation. There are many risks resulting from the very strong assumptions of the theory. However, the share price is a significant price indicator in any acquisition valuation process and is usually the outgoing (minimum) price for negotiations, above which the acquisition price is determined.

4.4. Relative Valuation

Although we try to develop a sophisticated valuation model, in reality the prices of most assets are determined in the market by a comparison to prices of similar assets. In a quick valuation, most analysts will probably utilize the principles of relative valuation. In relative valuation, the value of Company A is derived from the value of a comparable Company B or a set of comparable firms, a peer group. The relative valuation methodology utilizes standard variables such as earnings, book value, profits, and sales. We define a relative measure or multiple to be the ratio of value or price to a standardized variable.

(Value of Company A / standardized variable of Company A) = (Value of Company B / standardized variable of Company B) = Relative Measure (Multiple)

4.4.1. General Overview of Relative Measures

In fact, there is an unlimited range of possible relative measures. The only condition for a relative measure is that it be economically relevant and justifiable for the particular case. The following measures predominate.

1. **Earnings multiples**
   The value of an asset is related to the cash flow it generates. An example is the price-earnings ratio (P/E), which expresses the share price (P) to current or expected earnings per share (EPS).
   $$P/E = \frac{P}{EPS}.$$

2. **Book Value multiples**
   An example is the price-book value ratio (P/BV) obtained by dividing the share price (P) by the book value of equity per share (BV).
   $$P/BV = \frac{P}{BV}.$$

3. **Revenue multiples**
   The share price or value of a company may be related to revenue or sales as a measure of business volume. Often utilized is the price-sales ratio (P/S), where market value per share is divided by revenues per share (S).
   $$P/S = \frac{P}{S}.$$

4.4.2. P/C Insurance Industry Specific Relative Measures

All three of the above categories are seen in the P/C insurance industry. Sales ratios express the value of a company as a multiple of gross written premium or net written premium. P/E ratios and book value ratios are also used.

Note that P/E ratios and book value ratios are determined from accounting quantities such as earnings and book value of equity. Accounting principles serve as a first approximation of company value. Premium, as the denominator of sales or revenue ratios, is not as dependent on accounting rules. Many practitioners prefer sales ratios.

We demonstrate the application of relative valuation by means of a decomposition which relates value to premium. This procedure reveals the implicit assumptions underlying a given relative measure. For simplicity, denote premium by P, not to be confused with the same abbreviation for price. We express company value (V) as related to premium (P). We do not distinguish between gross and net premium.

Consider a group of peer companies with ratio V/P. The task at hand consists of two parts:

- Determine a V/P ratio for the valuated company based on a peer group analysis
- Analyze the underlying assumptions

Decomposition of the V/P ratio into relevant driving factors makes this a feasible task. In the first step, we suppose that the value V, as determined by the (V/P) ratio, corresponds to the sum of discounted values of future cash flows or profits. In other words, we utilize the DCF approach. If we replace cash flows by profits, assume that all profits are to be distributed, and suppose an infinite time horizon with stable profits, the value is given in perpetuity by the form:

$$V = \text{Profit} / \text{CoC} \tag{4.1}$$

where: CoC = cost of capital
Profit = expected profit at time t = 1.
.

For the sake of simplicity, the profit variable is defined as follows:

$$\text{Profit} = P - L - C + IR \tag{4.2}$$

where: P = premium
L = claims
C = costs
IR = investment result.

$$V = \text{Profit} / \text{CoC} = (P - L - C + IR) / \text{CoC}. \tag{4.3}$$

Substituting equation (4.3) into the V/P ratio, we obtain:

$$V/P = \frac{1}{CoC} * \frac{\text{Profit}}{P} = \frac{1}{CoC} * \frac{P - L - C + IR}{P} = \frac{1}{CoC} * (1 - L/P - C/P + IR/P). \tag{4.4}$$

The sum (L/P + C/P) is the combined ratio. We further define the investment result (IR) as the product of investment yield (IY) and the state of the investment portfolio (I).

$$IR = I * R. \tag{4.5}$$

The investment portfolio (I) as a percentage of premium (P) is known by the term asset leverage (AL).

$$AL = I / P. \tag{4.6}$$

Substituting the relationships (4.5) and (4.6) into equation (4.4), we obtain:

$$V/P = \frac{1}{CoC} * [(1 - \text{combined ratio}) + AL*IY). \tag{4.7}$$

How do we interpret this equation? It is derived from the equilibrium relationship between relative measure (V/P) and the value determined by the DCF approach. We thereby express the V/P ratio in relation to:

- CoC (a measure of investment risk)
- Combined ratio (a result of the underwriting)
- Investment yield (a result of investment)
- Asset leverage (a measure of time delay in the insurance process, a function of product mix)

Based on this ratio decomposition, we better understand the assumptions underlying a given relative measure. The decomposition also elucidates structural differences among companies including portfolio structure, combined ratio, and average time delay of insurance processes. Complicating factors include growth in profits and retained profits but the principles in a more complicated analysis would be the same.

We illustrate this type of ratio decomposition with some real figures. We extend equation (4.1) by a parameter representing growth rate of profit. If profit is assumed to grow at a flat rate of g% over an infinite time horizon, the DCF approach yields a value (V) given by:

$$V = \frac{\text{Pr}\,ofit}{CoC - g} \text{ for g = growth rate of profit.} \qquad (4.8)$$

Equation (4.7) is modified accordingly:

$$\frac{V}{P} = \frac{1}{CoC - g} * [(1 - \text{combined ratio}) + AL*IY). \qquad (4.9)$$

A rule of thumb widely used by practitioners is that the value of an insurance company moves in the range of 1:3 times annual premium. Based on equation (4.9), we explore this rule of thumb with respect to changing combined ratio and growth rate of profit. The other parameters remain fixed.

V/P ratio in dependence on combined ratio and growth rate of profits

V/P = [1 / (CoC – g)] * [(1 – combined ratio) + AL*IY), where:

V/P	Value (V) as related to premium (P)
CoC	Cost of Capital
G	Growth rate of profits
AL	Asset leverage (I / P)
IY	Investment yield

Assumptions:		**Parameters:**
CoC	9%	Combined rat.
IY	5%	Growth (g)
AL	2,0	

		Combined ratio										
		95%	96%	97%	98%	99%	100%	101%	102%	103%	104%	105%
Growth (g)	5%	3,75	3,50	3,25	**3,00**	2,75	2,50	2,25	2,00	1,75	1,50	1,25
	4%	**3,00**	2,80	2,60	2,40	2,20	2,00	1,80	1,60	1,40	1,20	1,00

3%	2,50	2,33	2,17	2,00	1,83	1,67	1,50	1,33	1,17	1,00	0,83
2%	2,14	2,00	1,86	1,71	1,57	1,43	1,29	1,14	1,00	0,86	0,71
1%	1,88	1,75	1,63	1,50	1,38	1,25	1,13	1,00	0,88	0,75	0,63
0%	1,67	1,56	1,44	1,33	1,22	1,11	1,00	0,89	0,78	0,67	0,56

Under the assumptions of this simplified model, the V/P ratio of 3 corresponds to either a 5% growth rate and 98% combined ratio or a 4% growth rate and 95% combined ratio. Although very simple, this type of scenario analysis provides very strong conclusions concerning the implicit valuation assumptions.

What matters in a relative measure is the set of assumptions. The assumptions are the same in the DCF approach: all cash flow components of the profit, growth in profits as a cash flow, and risk. The decomposition expresses the assumptions in a transparent, explicit form.

The application of relative valuation is a simple but good rule of thumb for the appreciation of value adequacy, enabling us to restrict the range of possible outcomes. However, there are dangers. What are the main risks of the method? The method of relating one firm's value to that of a comparable firm by means of one financial parameter is simplistic. This assumption is made in retail industries with relative ease. An application of the assumption to P/C Insurers omits key structural differences:

- Product mix
- Risk profile
- Company size
- Differences in distribution channels, target audience, and organizational infrastructure
- Differences in life cycles

Additionally, the method automatically assumes that the value of the other company is "correct". For these reasons, we advise a decomposition of the relative measure to get an explicit set of assumptions concerning profitability, growth in profitability, and risk.

The advantages and disadvantages of relative valuation are summarized as follows:

(+) Quick and quite simple calculation
(+) Restricted number of explicit valuation assumptions
(-) Hidden valuation assumptions
(-) Possibly difficulties in finding comparable firms
(-) Inherent assumptions regarding the "correct" value of comparable firms
(-) Appropriateness (economic relevance) of the relative measure for the determination of value

As an exclusive measure for the P/C Industry, the relative measure approach is simplifying and thus very dangerous. It omits structural differences. We therefore strongly emphasize the analysis of hidden valuation assumptions. Its simplicity allows the use of the measure as an additional method supporting the basic and more sophisticated valuation model.

4.5. Discounted Cash Flow Approach (DCF)

The various modifications of the DCF approach serve as a basis for the majority of valuation models. The leading principle of the theory is the rule of present value. The value of any asset is determined by the present value of the expected future cash flow.

The basic valuation equation of the DCF approach is written as follows:

$$\text{Value} = \sum_{t=1}^{T} \frac{CF_t}{(1+r)^t} \tag{4.10}$$

where: T = time horizon over which there is cash flow on the asset
CF_t = cash flow in time period t
r = discount rate reflecting the risk of the cash flow.

DCF models are classified into two main types of model. The first approach values the shareholder's equity. The second branch values the debtor's equity as well. The difference in the two models lies in the relevant cash flows and in the discount rate applied to those cash flows. In the first model (1), the discount rate is the cost of equity, the rate of return required by shareholders. In the second model (2), the value of the firm is obtained by discounting at the cost of debt weighted on the average cost of equity.

The first model, a dividend discount model (DDM), assumes dividends to be the only relevant cash flow. A strict application of the DDM is too restrictive since many firms do not pay adequate dividends. Free cash flow to equity is a broader definition, see Damodaran (7). We consider the specific asset-liability structure of financial service firms and choose the first approach for P/C Insurance companies. We value the cash flow to equity by discounting at a selected cost of equity, the cost of capital (CoC).

$$\text{Value of equity} = \sum_{t=1}^{T} \frac{CF\_to\_equity_t}{(1+CoC)^t}. \tag{4.11}$$

A discussion of key inputs is deferred:

- Cash flow projection (Section 5.2.3)
- Discount rate CoC (Section 5.2.2)
- Comparison of the DCF and EVA approaches (Section 5.2.1)

The advantages and disadvantages of the Discounted Cash Flow approach are summarized as follows:

(+) Prospective valuation of future profit
(+) A full theoretical justification: "The value of any asset is determined by the present value of expected future cash flows."
(+) The basis for major valuation models in practice
(-) Several assumptions estimated for a long time horizon (cash flow determination, CoC)
(-) Sensitivity to inputs
(-) Single scenario approach with no variability in future cash flows

Traditionally, there has been broad agreement in the financial theory that the value of a firm is determined by the present value of expected cash flows and thus DCF serves as a basis for any valuation model. However, several theoretical objections have recently been raised

concerning an exclusive application of the DCF model. DCF does not capture the variability of cash flows, which plays a very substantial role in the valuation of strategic issues. Embedded options (real options) include the flexibility to expand projects, to postpone additional expansion, or to abandon projects.

4.6. Option Pricing Theory (OPT)

Thesis: "Firms sometimes invest in projects because the investments allow them either to make further investments or to enter other markets in the future. In such cases, we can view the initial projects as yielding options allowing the firm to invest in other projects, and they should be willing to pay a price for such options. Put another way, a firm may accept a negative net present value (NPV) on the initial project because of the possibility of high positive NPV on future projects." (Damodaran A.: Investment Valuation: Tools and Techniques for Determining the Value of Any Asset; John Wiley and Sons, Inc.; 2002, p. 796.)

The 1990s witnessed a full acceptance of this thesis. The cash flows of certain assets are contingent upon future events. Such assets are referred to as real options and are characterized by two basic aspects of the option:

- The value of the first asset is derived from the value of a second asset
- The cash flow of the asset is contingent on the occurrence or non-occurrence of an event

Traditional DCF models underestimate the value of real options. Thus, option pricing theory has become a necessary tool to reflect these specific cases in the valuation. We present the fundamental principles of option pricing theory. The pioneering work into option valuation is connected with the papers written by Black-Scholes (1) and Merton (26).

Definition: Options provide the holder with the right to buy (call option) or sell (put option) a specified quantity of an underlying asset at a fixed price (strike price; exercise price) at (European option) or also before (American option) the expiration date of the option. Since it is a right and not an obligation, the holder can choose not to exercise the right and allow the option to expire.

The value of an option depends on the following factors:

1. The relationship between strike price and the current value of the underlying asset. The higher the strike price, as compared to the current value of the underlying asset, the higher the option price.
2. The variance in the value of the underlying asset. The higher the variance in the value of the underlying asset, the higher the price of the option.
3. Time to expiration. The greater the time to expiration, the more valuable the option.
4. Risk-free interest rate. The rate is connected to opportunity costs over the lifetime of an option.

The value of an option in financial theory is determined by the well known Black-Scholes-Merton formula. We present the binomial option pricing model, a discrete counterpart to the continuous Black-Scholes-Merton model. In a binomial tree, the option price is associated with the upward or downward movement in stock price. The simplest case is the one-step

binomial tree where the stock price moves either up or down into one of two positions and the option price takes on at most one of two associated values[4].

The binomial model provides insight to the logic of option pricing theory in a case study of the motor third party liability (M-TPL) market of the Czech Republic.

BOX: Case Study - Application of Option Pricing Theory

There was demonopolization of the Motor third party liability (M-TPL) market in the Czech Republic 3 years ago. It can be understood as a special case of market share acquisition.

First, we assume that according to the analysts' calculations this kind of acquisition is connected with the negative **NPV of -50 mio**. The management has to make the decision as to whether the company should invest in this project or not.

If the decision were based only on the rule of the positive net present value, the company would not make this investment. On the other hand, executive management argues with the thesis that the acquisition is connected with the unique opportunity of further expansion in the future. This aspect was not considered in the NPV calculation. Managers build on the assumptions that the Czech insurance market is underdeveloped and a substantial growth in all branches can be expected. In their views, the acquired M-TPL clients' base represents the cross selling opportunities. If that is the case, and the company does not make the investment, it gives up the right (option) of a good outgoing position in the expected future expansion. In other words, **acquisition of M-TPL market share implicitly includes the option to expand** as well.

What is the value of this embedded option to expand?

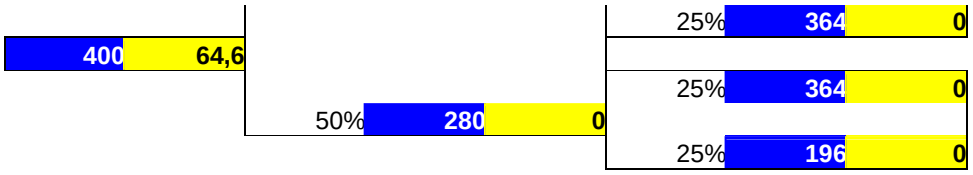
Let us assume that the costs connected with the additional expansion in the future would be 500 mio (strike price) and at the moment the current NPV is estimated at 400 mio (current value of an asset, t=0). The option will be exercised only if the NPV at time of expiration (t=2) exceeds the costs of expansion (strike price).

NPV of entry into M-TPL market	**-50**
Option to expend:	
Costs of expansion - Call strike price	500
Borrowing interest rate	10%

Furthermore, we assume the following binomial process (the expected development of NPV over the next two years):

t=0		t=1			t=2		
Current NPV	Call price	Probability	Current NPV	Call price	Probability	Current NPV	Call price
					25%	**676**	**176**
		50%	**520**	**106,7**			

[4] For more on binomial trees we refer to Hull J. C.: Options, Futures, & Other Derivatives; Prentice Hall; 1999, Chapter 9.



Explanation: The value of the call option is arrived at by applying arbitrage theory. We can replicate the cash flow from the option as a combination of borrowing and purchase of underlying asset (current NPV).

Value of the call = Current NPV * Option delta - Borrowing needed to replace portfolio,

where: Option delta = $(C_U - C_D) / (NPV_U - NPV_D)$

Borrowing needed to replace portfolio = Option delta * $NPV_D / (1+ i)$

NPV_U = the value of NPV if current NPV goes UP

NPV_D = the value of NPV if current NPV goes DOWN

C_U = call price of option if current NPV is NPV_U

C_D = call price of option if current NPV is NPV_D

Running the calculation backwards. At the expiration time t=2 the option value (call price) is given by the positive difference between current NPV and strike price. Going back to the present, we can calculate the option value at the time t=1, based on the above equations. Looking at the lower branch of the binomial process, the value is obviously 0 (current NPV at the time t=1 can go from 280 to 364 or 196 vs. strike price = 500). In this case, the option would not be exercised. The option value for the upper branch at the time t=1 (current NPV of 520 can move on to either 676 or 364) is given by the above equations:

Option delta = 176 / (676-364); Borrowing = Option delta * 364 / (1+10%); Value of the call = 106,7

Similarly, we can calculate the value of expansion option at the time t=0.

Conclusion:	
NPV of entry into M-TPL market	**-50**
Value of option to expand	**64,6**
NPV of entry into M-TPL market with option to expand	**14,6**

The company should enter into the M-TPL market although the value according to the NPV calculation is negative. That is because of the acquisition of the option to expand. The value of this option is estimated to be higher than negative NPV from entry into M-TPL market.

It is important to keep in mind that we meet with real (embedded) options in daily life. In fact, options are present anywhere we have a certain amount of flexibility at our disposal in decision-making.

DCF-based models assume a passive treatment of assets and liabilities but managers have many opportunities to change a pre-defined course in reaction to current developments. Real options are then crucially important and their values can be substantial. Real options quantify the value of strategic aspects in a very sophisticated way. Managers who have familiarized themselves with option pricing theory justify their investments by the value of embedded options. Therefore, we must apply the valuations very carefully. It means correctly identifying any real option to be considered in the valuation. As an example, if the option is

freely available to all market participants, it should not represent an option to be considered in the valuation.

The advantages and disadvantages of the OPT approach are summarized as follows:

(+) Overcomes the drawback of DCF by reflecting the variability of future cash flows
(+) Full theoretical justification in main-stream financial theory
(+) The application is becoming a standard tool in specific areas
(+/-) A very sophisticated model
(-) Requires many valuation assumptions, including variability parameters
(-) Sets a high requirement on analysts' and decision makers' capabilities
(-) Very sensitive to inputs
(-) Is easily manipulated and misused

The theoretical concept of real options was initially used in the valuation of start-up companies and fast growth sectors such as new economy and biotechnology sectors. OPT is also recognized in the value of a company as a call option. Stockholders act as holders of an option on the company's assets with a strike price at the level of the company's liabilities.

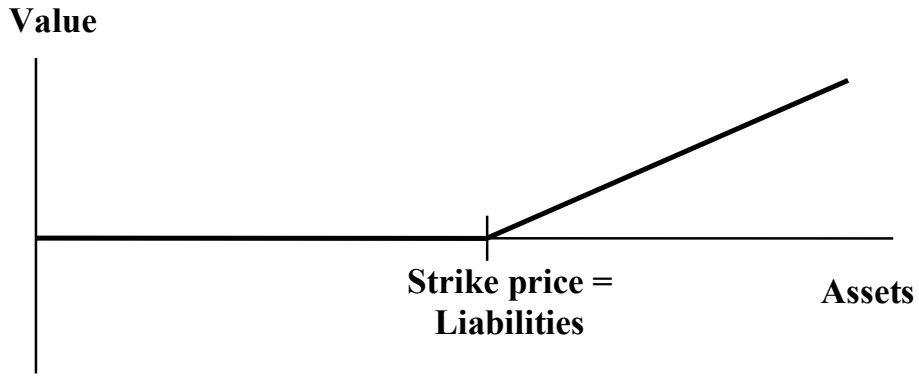


Figure 2: Value as a call option on company's assets

In the P/C Industry, it potentially changes the way of thinking of an investment. The crucial contribution of real option valuation is the recognition of the flexibility in decision-making. Real options may be equated with future opportunities and dangers. Option pricing theory offers an opportunity to embrace this aspect of the valuation process.

4.7. Conclusion

We have briefly presented the main theoretical methodologies for the valuation of a firm with special emphasis on an application to the P/C Insurance industry. We introduced the models in their strict form, stressing underlying assumptions. We discussed how the models are to be applied, as well as the limitations and inherent risks.

Analysts use a wide range of valuation methods in practice, derived by modifications and combinations of the basic models. The models differ in underlying theory, basic assumptions, complexity, and outcome. We cannot say which valuation model is best. It always depends on the specific case. What matters is the precise application of the selected model with respect to its underlying assumptions. Although we usually rely on one basic valuation

methodology, which is a combination of several methods in the valuation model, it is advisable to not restrict oneself to only one method. We strongly recommend the application of methods other than the basic valuation method to uncover inconsistencies in the inputs. We should also confront the results of whatever methods we choose. Do the results meet our expectations? Are the results reasonable?

In the next section, we present the Economic Value Added (EVA) approach as a modification to basic valuation methods. EVA is widely used and plays an important role in practice. It follows primarily from the principles of DCF. Firstly, we discount the excess of future profits net of the costs of holding capital. Secondly, we consider the current state of invested capital, the NAV determination, where the principles of a book value approach are recognized. EVA methodology has become a very popular tool in financial management for profitability measurement and valuation. The task is to justify our thesis that this approach serves as a good basis for the valuation modeling of P/C Insurers.

5. EVA as a Basis for the Valuation of P/C Insurers

In the previous section, we created a framework of basic valuation methods as developed in corporate finance. This framework provides coherence to the Economic Value Added methodology we present here. We explore the EVA-based valuation as a methodology built upon traditional DCF models. An EVA valuation approach extends the DCF approach by a further consideration of investor's needs. EVA is a measure of surplus value created by an investment. It is defined as profit adjusted by the cost of holding capital.

In this Section, we firstly examine the theoretical background of EVA. We then develop, step by step, a valuation methodology for P/C Insurers.

5.1. Theoretical Background

The EVA methodology was created at the beginning of the 1990's by the consultancy Stern, Stewart & Co. Stewart defined EVA as "operating profit less the cost of all capital employed to produce those earnings[5]". We note that the concept of economic profit brings nothing new to economic theory[6]. EVA methodology is widely used in financial management for the measurement of profitability and the valuation of a company.

We can summarize the main thesis of the EVA approach as follows:
"The EVA valuation approach meets one of the most important requirements consisting of the preference of the investor's point of view instead of that of the company."

5.1.1. The EVA-based Valuation

We derive the basic equations of the EVA valuation approach. In its simplest form, EVA is defined as Profit after Tax (PaT) earned on invested capital and adjusted by the costs of holding capital, reflecting investors' opportunity costs. The cost of holding capital is defined as the product of invested capital and the required return on invested capital.

$$\mathbf{EVA_t = PaT_t - CoC * Invested\ Capital_{t-1}} \qquad \mathbf{(5.1)}$$

where: EVA_t = EVA in year t
PaT_t = Profit after Tax in year t
$Invested\ Capital_{t-1}$ = capital provided by investors at the end of the previous year (= at the beginning of the current year)
CoC = Cost of Capital (equity).

We need three basic inputs to calculate EVA:

1. After tax profit generated on invested capital
2. The rate of CoC (discussed further in the text)
3. Invested capital

Either the book value of equity or Net Asset Value (NAV), following the economic approach to valuation, can be used to define invested capital. The economic approach to valuation

[5] Stewart, G.B.: The Quest for Value. Harper Collins 1991. New York.
[6] A basic course of microeconomics covers the topic of economic profit, taking into account expensed costs and opportunity costs (e.g. costs of capital).

better reflects investors' requiremenets and the market environment, we operate exclusively with NAV.

$$\mathbf{EVA_t = PaT_t - CoC * NAV_{t-1}.} \quad \mathbf{(5.2)}$$

Positive EVA implies a company's ability to generate profits above a level required by investors for a given level of risk. The company, therefore, brings additional (added) value to investors. Negative EVA is interpreted as a negative message to investors, expressing that profits are not comparable to other investments with the same risk or opportunity cost.

Dividing equation (5.2) by the NAV yields a reformulation of the basic equation in relative terms:

$$EVA / NAV = PaT / NAV - CoC * NAV / NAV. \quad (5.3)$$

PaT / NAV represents return on invested capital, which we denote for simplicity as ROE[7]:

$$EVA / NAV = ROE - CoC \quad (5.4)$$

$$\mathbf{EVA = (ROE - CoC) * NAV} \quad \mathbf{(5.5)}$$

where: ROE = return on invested capital (NAV).

Equation (5.5) is to be understood as follows. The company generates positive added value if the return on invested capital (ROE) exceeds the cost of capital (CoC). It implies that EVA can be increased either through higher operating efficiency under the same level of risk, increasing ROE, or by reaching the same profit by lowering the risk to decrease CoC.

Next, Market Value Added (MVA) is defined as the present value of future EVAs:

$$MVA = \sum_{t=1}^{T} \frac{EVA_t}{(1+CoC)^t} + \frac{EVA_{T+1}}{CoC * (1+CoC)^T} \quad (5.6)$$

$$MVA = \sum_{t=1}^{T} \frac{PaT_t - CoC * NAV_{t-1}}{(1+CoC)^t} + \frac{PaT_{T+1} - CoC * NAV_T}{CoC * (1+CoC)^T} \quad (5.7)$$

where: EVA_t = EVA in year t
T = No. of years over which EVA is explicitly estimated (from the period T+1 calculated as perpetuity)
CoC = Cost of Capital (equity)
NAV_{t-1} = (market) value of invested capital at the end of previous year
PaT_t = Profit after Tax in year t.

Based on the EVA methodology, the value of a company (V) is defined as the sum of invested capital (NAV) and the present value of future EVAs (MVA):

$$\mathbf{V = NAV_0 + MVA} \quad \mathbf{(5.8)}$$

[7] Throughout this text, we understand the term ROE to mean return on invested capital, represented by NAV according to the economic approach.

where: NAV_0 = (market) value of invested capital as of appraisal date.

$$V = NAV_0 + \sum_{t=1}^{T} \frac{EVA_t}{(1+CoC)^t} + \frac{EVA_{T+1}}{CoC * (1+CoC)^T}. \quad (5.9)$$

$$V = NAV_0 + \sum_{t=1}^{T} \frac{PaT_t - CoC * NAV_{t-1}}{(1+CoC)^t} + \frac{PaT_{T+1} - CoC * NAV_T}{CoC * (1+CoC)^T}. \quad (5.10)$$

In other words, the value of a company is determined on one hand by the current state of invested capital (NAV), as the difference between the (market) values of assets and liabilities, and on the other hand by the discounted excesses of future profits above the level of yield on alternative investments (CoC). By this equation, the valuation task is divided into two separate steps:

- Determination of NAV,
- Projection of future cash flow including the determination of discount rate (CoC), consisting of explicit cash flow modeling and determination of terminal value (TV).

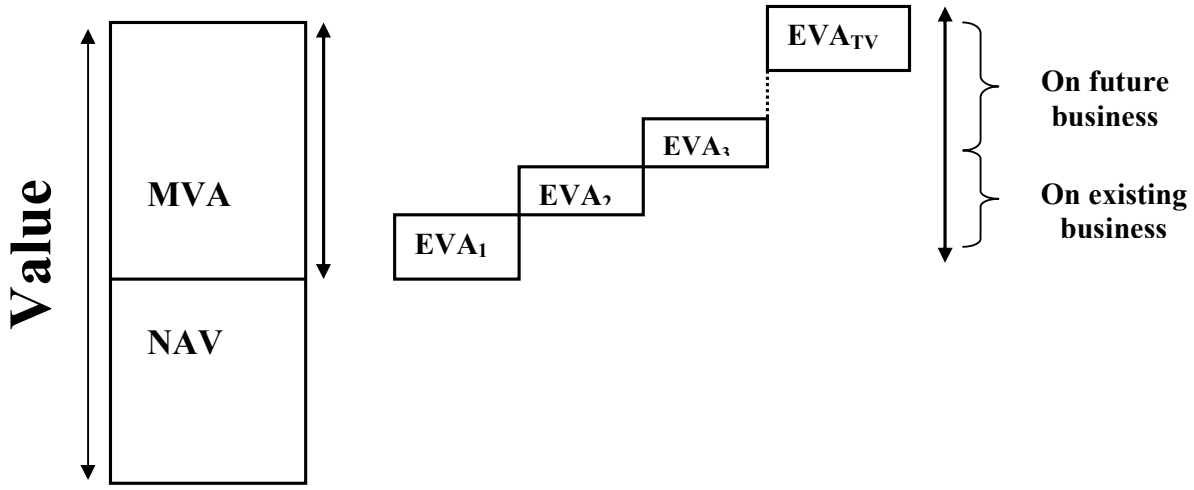


Figure 3: Main features of EVA-based valuation[8]

EVA vs. DCF approach

We have already several times mentioned, that EVA-based valuation approach is deduced from DCF. What is the interrelationship between DCF and EVA-based valuation approach? For simplicity, let us assume the infinite horizon (present value of future profits calculated as perpetuity). So, the values of a company are defined as follows:

1) According to EVA

By the EVA approach, assuming an infinite horizon with stable profits, the value of the company (V) is derived from equation (5.10).

[8] The values of EVAs are depicted already at their discounted values.

$$V = NAV_0 + \frac{EVA_1}{CoC} = NAV_0 + \frac{PaT_1 - CoC * NAV_0}{CoC} = \frac{CoC * NAV_0 + PaT_1 - CoC * NAV_0}{CoC}$$

$$= \frac{PaT_1}{CoC}. \qquad (5.11)$$

2) According to DCF

Substituting cash-flow in the basic DCF equation (4.9) by after tax profit distributed to shareholders and assuming an infinite horizon with stable profits, we obtain a perpetuity.

$$V = \frac{PaT_1}{CoC}. \qquad (5.12)$$

Conclusion: (5.11.) = (5.12.)

We have just proven for infinite horizon[9] with stable profits, there is no difference between EVA-based valuation and DCF.

Generally, we suppose in the theoretical models the distribution of profits to shareholders. However, in the valuation models we very often assume that profits are retained in the company to finance additional growth. Therefore, we must always very precisely keep the same treatment of distributed / retained profits across the whole valuation[10]. Let us illustrate both extreme cases, either full distribution or full retention of profits, with regard to DCF and EVA on the following example.

Comparison between EVA based valuation and DCF

Inputs:

NAV_0	100	$ROE_{1,\dots,10}$	12%
CoC	10%	$ROE_{>=11}$	10%

	Distributed profits: $NAV_t = NAV_{t-1}$					Retained profits: $NAV_t = NAV_{t-1} + PaT_t$				
				DCF approach	EVA based approach				DCF approach	EVA based approach
T	NAV_t	PaT	EVA	Discounted PaT	Discounted EVA	NAV_t	PaT	EVA	Discounted PaT	Discounted EVA
0	100,0					100,0				
1	100,0	12,0	2,0	10,9	1,8	112,0	12,0	2,0		1,8
2	100,0	12,0	2,0	9,9	1,7	125,4	13,4	2,2		1,9
3	100,0	12,0	2,0	9,0	1,5	140,5	15,1	2,5		1,9
4	100,0	12,0	2,0	8,2	1,4	157,4	16,9	2,8		1,9
5	100,0	12,0	2,0	7,5	1,2	176,2	18,9	3,1		2,0

[9] We would come to the same conclusion, if we used for the first several years explicit modeling and for the rest the calculation of terminal value as perpetuity (this can be proven in the same way).

[10] As a warning remark, however obvious, the authors met the practical valuation applications, which considered retained profits both as a component of discounted cash flow and the item increasing NAV and thus terminal value.

6	100,0	12,0	2,0	6,8	1,1	197,4	21,1	3,5		2,0
7	100,0	12,0	2,0	6,2	1,0	221,1	23,7	3,9		2,0
8	100,0	12,0	2,0	5,6	0,9	247,6	26,5	4,4		2,1
9	100,0	12,0	2,0	5,1	0,8	277,3	29,7	5,0		2,1
10	100,0	12,0	2,0	4,6	0,8	310,6	33,3	5,5		2,1
Sum (t = 1, …, 10)				73,7	12,3				-	19,7
11	100,0	10,0	-	3,5	-	341,6	31,1	-	10,9	-
Terminal Value				38,6	-				119,7	-
NAV_0				-	100,0				-	100,0
Value				**112,3**	**112,3**				**119,7**	**119,7**

Remarks: In the case of retained profits, the value of invested capital (NAV) at the end of a period is given by the sum of the value of invested capital at the beginning of that period plus retained profits. Since we are discounting only the cash flow to shareholders, this case implies that the value according to DCF is given only by the terminal value. The crucial vulnerability of DCF can be seen in the weight, which is given by the terminal value. The higher portion of retained profits, the higher share of terminal value on the total value in the DCF applications. Although from the theoretical standpoint both EVA and DCF are derived from the same background and therefore should bring the same results, we find EVA-based valuation as better reflecting the practical needs (see chapter 5.1.2).

Remark: Comparison of Miccolis concept with EVA (see Miccolis (27))
The Miccolis concept concerning valuation of P/C Insurance Companies based on the term of economic (respectively actuarial) value is developed from the same fundamentals as EVA based valuation.

Economic value = Current net worth (1) + some adjustments (2) + discounted value of future earnings (3) – costs of capital (4) = NAV (1+2) + MVA (3+4)

Miccolis offers the same approach. The key contribution of EVA is a full acceptance and incorporation into current Corporate Finance Theory.

5.1.2. Main Advantages of the EVA-based Valuation Approach

In the following paragraphs, we explain why EVA - when correctly applied – can represent a good theoretical tool for valuation of P/C insurers and can offer some advantages as compared with DCF. One can ask, what are the unique aspects in the application of EVA-based valuation for P/C Insurers. The most probable answer, that there is nothing special, can be at the first glance surprising. But when looking at this issue in a more detail, this feature is becoming the biggest advantage of EVA applications. In fact, the clarity and understandable interpretation makes EVA a very useful tool for valuation in insurance industry as well, building upon the traditional discounted cash flow models. Generally, we can identify the following key arguments for the application of EVA-based valuation in the P/C Insurance industry:

1. Consistent with Shareholder Value Management. An emphasis is placed on the investors' needs. The EVA approach enables us to clearly identify the investors' requirements and expectations with regard to risk-reward trade-off. It makes the valuation transparent.

2. Consistent with a traditional accounting approach. Furhermore, the importance of CoC, the discount rate, is seen more easily in this approach.

3. Consistent with current corporate finance theory. The EVA methodology is thoroughly developed and fully integrated into current corporate financial theory. It is consistent with a firm's accounting statements.

4. Consistent with an actuarial approach. EVA as a tool for the measurement of profitability and for valuation purposes is easily incorporated into actuarial DFA models.

5. The economic approach is easily incorporated. The valuation analysis is derived from accounting statements and is thus easily transformed into an economic point of view for NAV determination and consecutive cash flow projection.

6. Standardization and general acceptance. The simplicity of the leading principles and comprehensibility has contributed to the general acceptance of the theory. What would be the contribution of a theoretical approach if nobody understood it and therefore did not trust its results?

7. The decomposition of an EVA valuation allows a clear understanding of the components of the acquisition price. Adequacy of the acquisition price can easily be seen from the two components NAV and discounted future profits. The NAV, the difference between assets and liabilities, is the current state of invested capital. Future expectations of profitability are calculated as the discounted excesses of future profits.

8. Treatment of terminal value. The determination of terminal value in a DCF application is problematic. The treatment of terminal value in the presented EVA-based valuation approach is based on the assumption that in the long term infinite horizon, the company's ability to beat the market in reaching a higher return on invested capital (ROE) than the average corresponding to CoC is restricted (see 5.2.3.2). This implies that the terminal value in an EVA application should be set to zero, under the assumption that ROE = CoC in the long term. In comparison to the DCF approach, EVA represents a safer and more controllable tool, ensuring no overestimation of future late profits and terminal value.

9. A clear link between the profitability and the valuation of a company. EVA provides a clear connection between a performance measure for a given time period, the flow, and the value of the company at a particular point in time, a state.

5.2. The Application of an EVA-based Valuation to P/C Insurers

We have established a comprehensive theoretical framework for EVA-based valuations, provided a comparison to the DCF approach, and described key contributions of this approach to the valuation of P/C insurers. We now shift our attention to creating procedures for an application to the P/C Insurance industry. Appendix C provides an illustrative case study of an acquisition of a P/C Insurer from the CEE region, highlighting specific considerations.

We start with the determination of NAV from the basic equation (5.9) of the framework we have developed.

$$V = NAV_0 + \sum_{t=1}^{T} \frac{EVA_t}{(1+CoC)^t} + \frac{EVA_{T+1}}{CoC * (1+CoC)^T}.$$

We compare the accounting and economic approaches to a valuation. An economic approach is preferable to an accounting approach since it better corresponds to the character of the P/C insurance business and the investors' point of view. We then consider the issue of cash flow projection including the determination of the appropriate discount rate CoC. Figure 3 of Appendix A illustrates the main features of an EVA-based valuation of P/C Insurers.

5.2.1. Determination of Net Asset Value (NAV)

The value of equity, reported in accounting statements and following accounting standards, generally results from the application of valuation principles to insurance assets and liabilities. There are other factors that potential investors should take into account. Net Asset Value (NAV) captures both the accounting term of equity and factors not captured by statutory accounting.

NAV = (Market) Value of Assets – (Market) Value of Liabilities

The value of NAV is the difference between assets and liabilities and depends on how particular items are valued. Accounting statements are the primary information source for the determination of NAV. However, NAV is an economic approach to valuation, including factors such as market values, best estimate adjustments, current market environment, and other factors to correctly reflect the investors' point of view. NAV includes the objective of the decision-makers.

Generally, the determination of NAV consists of several steps:

- Valuation of insurance assets
  = investments; other assets
  - from statutory accounting to economic approach
- Valuation of insurance liabilities
  = technical reserves
  - from statutory accounting to economic approach
- Other factors to be taken into consideration – e.g. solvency and other operational deficiencies

To illustrate the interrelationships between individual steps and resulting implications with respect to the determination of NAV, see also the following figure representing the logic structure of this chapter.

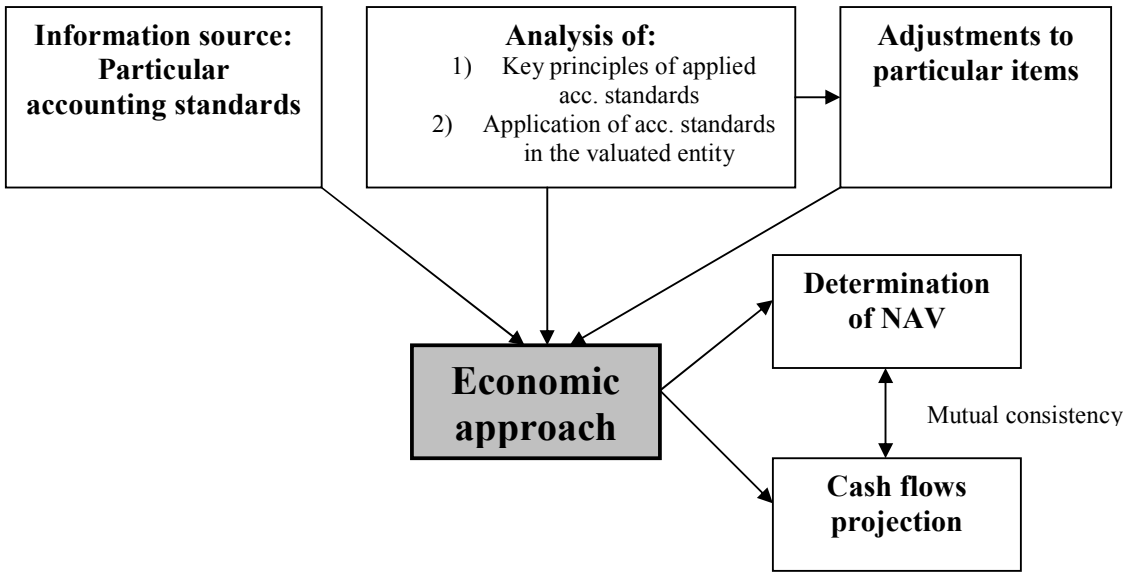


Figure 4: Primary implications of our approach

Accounting Standards and the Economic Approach

Knowledge of accounting standards is not sufficient for our purposes. We must go into further detail and explore how the accounting principles were applied and interpreted in the company's books. Many accounting experts are convinced of the exactness of accounting information and say there is only one "true and fair" picture of how to report the financial condition of a firm. However, there is always a certain amount of uncertainty in this respect. It occurs mainly in the accounting of financial services firms where there is a substantial time delay inherent in the business and room for differing interpretations (e.g. reserve adequacy). We also admit the danger of creative accounting, which after the recent accounting scandals seems to be possible anywhere, including countries with long and established traditional accounting systems.

NAV determination considers not only proven accounting principles but also the way in which they were applied and interpreted in a particular company.

The second part of this statement cannot be underestimated in the valuation process. We are of the opinion that a certain amount of skepticism towards information provided by accounting statements makes sense and can be beneficial for the valuation process. As discussed in Section 2, this rule of a little skepticism is becoming important in the P/C Insurance business.

Differences between accounting standards arise primarily from their respective objectives. As an example, consider the differences between SAP and U.S.-GAAP. SAP serves as a basis for state supervision and focuses primarily on surplus adequacy, the company's ability to meet obligations to policyholders. Therefore, the balance sheet is a major concern. GAAP, on the other hand, is based on accrual accounting and provides information concerning the components of a company's earnings. There are accounting standards whose objectives are a basis for tax calculations, and so on.

The objectives of an accounting standard further determine its underlying principles. In this respect, one criterion for classification can be the extent to which best estimate practice (market point of view) vs. the prudence of accounting principles (conservatism) are used. Accounting standards can also vary from the weights that are given either to accrual (matching concept) or cash flow principles. Furthermore, the valuation at historical costs vs. market (fair) values shows the inconsistency between accounting standards. We can also find accounting standards with some specific instruments and tools for insurance business, which can be contradictory to other accounting principles (e.g. equalization reserves).
With regard to unification in the field of P/C Insurance accounting, there are currently two leading accounting standards - US-GAAP in North America (but also for Europeans companies which are traded on the U.S. stock markets) and IAS in Europe (currently for insurance business under reconstruction).
There is agreement that the trend with respect to valuation of insurance assets is in the direction of application of (fair) market prices. On the other hand, concerning the valuation of technical reserves, the standards follow the principle of conservatism and do not allow the discounting of reserves. Furthermore, unforeseen losses / profits are recognized immediately (e.g. premium deficiencies). The booking of equalization reserves is generally not allowed.

The Economic Approach

One of the theses of our approach emphasizes the preference of the economic approach, being in line with the investors' point of view. This hypothesis was also supported in the analysis of specifics of the P/C Insurance business and their impacts for valuation, where we have intuitively accepted the necessity of implementing an economic approach to valuation, as better reflecting the specifics of P/C Insurance business. We are really convinced that the long term nature of the insurance business, uncertainty, and dependence on the legal and economic environments imply that the valuation methodology is an application of the economic approach. In our view, accounting standards cannot capture all the factors.
But we have not defined this term yet. At the first glance, everyone has a certain idea of what under an economic approach is to be understood. But there is no unified definition of this term in the economic practice. **The economic approach should generally extend the accounting information using the analyst's best estimate adjustments and other factors that need to be taken into consideration to correctly reflect the investors' point of view.**

Based on that, we could define the economic approach according to the following principles:
1. Long-term, prospective approach
2. Market valuation, best estimate practice
3. The rule of present value (time value of money)
4. More priority given to cash-flow rather than accrual accounting
5. More focus on the balance sheet instead of P&L
6. All known factors must be considered
7. All known uncertainty must be considered
8. Partly subjective character highlighting the analyst's role

Theoretically, we could make the following very strong statement. A clear application of the economic approach, and an inclusion of all current factors in the NAV determination lead to the valuation of a company determined only by NAV. In this case, NAV would implicitly include the firm's ability to generate profits corresponding to the risk of an investment, above a "normal" level. Goodwill is an example. The second component of our valuation equation,

the discounted excess of future profits (MVA) from cash-flow projections, would correspond exactly to the level of cost of capital, with an implication that MVA is zero by definition.

Of course, precise applications of an economic approach in the valuation models are only a theoretical issue. However, understanding this extreme case is important for the application of a particular economic approach in practical situations. We must further state the necessity of consistency between the NAV determination and cash-flow projections in the economic approach (see Figure 4). This consistency must be fundamental to valuation modeling with decisive practical implications.

To clarify the entire complex relationship of valuation by accounting principles vs. the economic approach, we show detail from several balance sheet items as well as other factors considered in the NAV determination.

I. Investments	**I. Liabilities**
1) Fixed income	**1) Claims reserves**
- available for sale	**2) Unearned premium reserves**
- held to maturity	**3) Equalization and catastrophe reserves**
- trading	**4) Other Liabilities**
2) Equity securities	
- available for sale	**II. Shareholder's equity (NAV)**
- trading	
3) Short term investments	
4) Mortgages and other loans	
5) Investment real estate	
II. Other assets	
- thereof: DAC	
- thereof: other deferred expenses	

Figure 5: Simplified balance sheet of P/C Insurance Company

The analyses of balance sheet items as shown on the figure above will be explored with respect to:

1. Country accounting standards (CAS) represented by Czech accounting standards as the base information source
2. US-GAAP (playing more and more important role in Europe as well)
3. Economic approach

Our goal is not to provide readers with a comprehensive description of precise accounting treatment. On the other hand, the presented overview will be aimed at some selected specifics and their impacts and consequences for valuation in order to record the most problematic issues and to keep the complexity of the paper. Whereby the strongest emphasis will be placed on the application of the economic approach.

Issues to be addressed are as follows:

- **Investments (book vs. market values)**
- **Treatment of DAC**
- **Other assets (w/o DAC) – e.g. deferrals**
- **Receivables from reinsurance and direct insurance**

- **Claims reserves (reserve adequacy, reserve discounting)**
- **Unearned premium reserves (premium deficiencies)**
- **Equalization and catastrophe reserves**
- **Solvency requirements (statutory, RBC)**
- **Other operational deficiencies**
- **Treatment of goodwill (elimination)**
- **Tax considerations (taxes, deferred taxes)**
- **Other market adjustments (cleaning of balance sheet)**

Investments

The treatment of investments across different accounting standards can vary in many respects. First, the classification by investment classes and the subsequent accounting valuation is of a big concern. Furthermore, the definitions of book and market values, the issue concerning recognition of changes in market values in P&L and balance sheet and so on represent the areas in which analysts should be interested. The differences in investment valuation can be very substantial. For instance, under US-GAAP, most bonds and equities are carried in a balance sheet in market values, except for "held to maturity" which is carried in amortized costs. But there are still certain items in an investment portfolio, such as real estate, which are valued at historical costs. On the other hand, under Czech accounting standards (until 2001) were the unrealized losses recognized both in P&L and balance sheet immediately after they occurred, while unrealized gains (hidden reserves) were forbidden to be considered either in P&L or in balance sheet (the principle of prudence). However, the worldwide trend moves on to unification in the direction of US-GAAP, representing a more market-orientated approach.
Therefore, the clear identification of valuation principles utilized in the accounting approach to investments is a critical assumption for the further treatment of investments in the economic approach.
But not only the used accounting standards should serve as an outgoing base for investments valuation according to economic principles. There are other factors such as market liquidity, information asymmetry on the market, the availability of credit ratings or market efficiency, which should be taken into consideration, as well. It is clear that all these points are of less importance in the developed markets, which works efficiently. But when valuing an investment portfolio of an insurer from a developing economy, it can be a crucial issue and a point of many struggles between negotiating parties. Here, we can find the cases that despite of the availability of market prices we cannot use since they do not reflect the reality due to e.g. low market liquidity.
Generally, we can say that the less liquidity and efficiency in the market, the higher space (and probably necessity) for analyst's adjustments above book and "quasi-market" prices.
To sum up, the valuation of investments according to an economic approach should follow as much as possible market prices (where available), whereby other factors need to be taken into consideration as well.
The above statement has been related to investment portfolio of an insurer covering technical reserves. In addition, an insurer can hold **strategic investments** in subsidiaries, where the valuation differences between accounting standards can be completely different. The best way is to exclude these investments and to value them separately. In this case, the role of analysts when valuing according to economic approach is even more important.

Deferred acquisition costs (DAC)

Generally, the accounting standards allow to defer the policy acquisition costs, following the accrual principle of matching between premium income (as earned premium) and the corresponding expenses (matching concept). The range of policy acquisition costs however,

which are supposed to be deferred according to earned premium income, can vary substantially. Under SAP for instance, the policy acquisition costs are included into P&L as they are incurred (no DAC). On the other hand, under US-GAAP both commissions for renewals and new business and internal acquisition expenses are to be deferred in proportion to earned premium. The Czech accounting standards represent in this respect a compromise; here only commissions from new business are allowed for deferrals.
Concerning the application of economic approach, we do not see any problem with deferrals of policy acquisition costs, under the assumption that there is a clear link between DAC and future business. Furthermore, if the time horizon for amortization of DAC is restricted to one year, it should not pose a problem for the valuation model to keep the consistent treatment with cash flow projection as well.

Other assets (w/o DAC)
We also recommend very careful analysis of other assets (w/o DAC), which can include some very doubtful items. Generally, the majority of other assets are carried in historical costs. First, we would suggest dividing this part of balance sheet into those items, which are connected to the insurance business, and the remaining items, not directly influencing the insurance business. The next criterion for classification of other assets should be, whether they really result in future economic benefits. Whatever kind of other assets not directly connected with insurance business, we propose to value them according to the economic approach as conservatively as possible, mainly when the effects on future business are negligible. The valuation at liquidating prices we find as the most feasible solution in this respect.
Furthermore, we advise paying close attention to all deferrals (excluding DAC) and other similar items. They can be treated under different accounting standards in a different way completely. The detailed analysis of these items, which can be shown in the balance sheet either explicitly or are hidden under tangible property (and amortized), should not be also underestimated. The clear connection to future business (profits) would be the decisive criterion. We are convinced, that an analyst cannot go too far wrong by following the principle that all doubtful assets are to be charged directly against NAV.

In summary, we see the following main rules, which are to be applied by the transmission of other assets into economic approach:

- Clear connection to insurance business
- Clear connection to future profits
- Elimination of any accounting playing with deferrals
- Preference of cash-flow to accrual accounting
- Controversial items are to be excluded from NAV

Receivables from reinsurance and direct insurance
All receivables either from reinsurance or direct insurance should be according to economic approach reclassified with respect to probability of getting money back. The appropriate revaluations should be charged directly against NAV. In the case of receivables from reinsurance, we can use the rating as a measure of default probability.

Claims reserves
Concerning valuation of claims reserves, we must explore two issues: **discounting** and reserves adequacy. Generally, the accounting standards require claims reserves to be estimated at their ultimate amounts, in which claims are expected to be settled. There can be some exceptions, where reserve discounting is allowed – e.g. under US-GAAP mainly for

claims with fixed and determinable payments (e.g. pensions from worker's compensation). However, the majority of claims reserves are valued without reflecting time value of money. The reason for non-discounting is that most claims reserves are estimates and the amount and timing of the payment cannot be determined with certainty (principal of conservatism). However, non-discounting means that expenditure is not matched with corresponding income. While all claims provisions must be provided when the premium is earned, the investment income, which may be used to pay the claims, is not recognized until a later accounting period. This leads to different results (and equity development) in both cases.
Let us illustrate the issue of profit recognition on the following figure. It is based on the assumption that claims reserves were set correctly (no run-off result). You can see that in the case of non-discounting the profits are recognized later on.

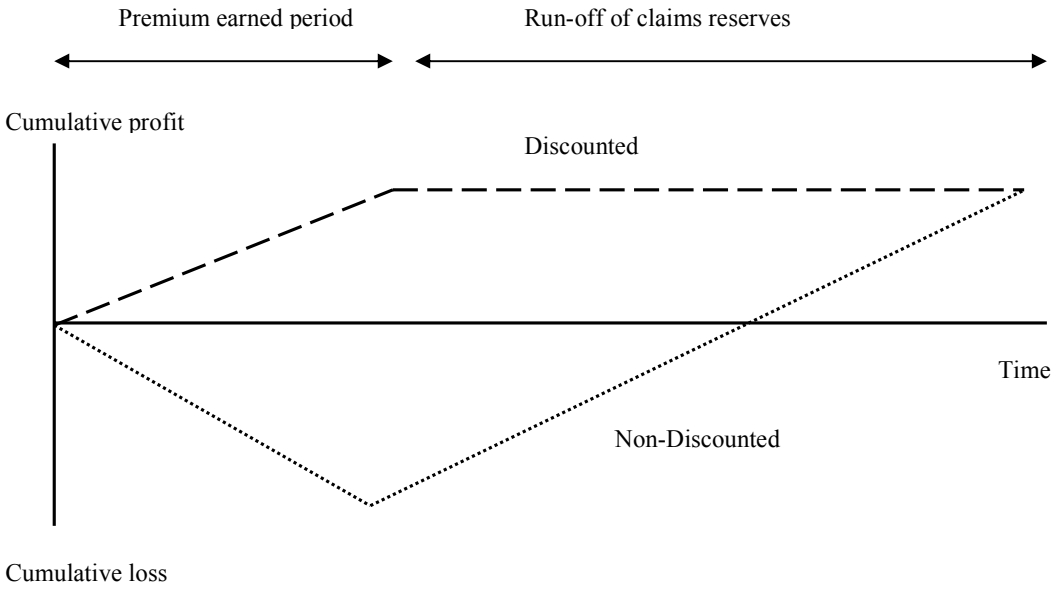


Figure 6: Profit recognition – discounting vs. non-discounting of claims reserves

Based on the definition of economic approach to valuation, it is obvious that reserve discounting is fully consistent with this concept. However, we can meet many possible ways in practice how to cope with this issue in the valuation modeling. Besides the theoretical correctness, we must always take into considerations other practical aspects as well. Nevertheless, what always matters is the mutual consistency of the selected treatment.
First, we can keep claims reserves exclusively at discounted values, what represents the most sophisticated solution requiring very precise and consistent treatment across the whole valuation model. In this case, we must be aware of the fact that any change in the assumptions regarding future interest rates or inflation would immediately impact, besides cash flow projection, the value of NAV as well. The other way is to keep reserve discounting on a separate account, enabling to balance both transparency and economical correctness. Last but not least, if we decide not to consider reserve discounting in the valuation model, then we must keep in mind that all changes in variables effective from the future must be reflected later on in the cash flow projection.

Reserve adequacy is the other actuarial issue. Although many accounting standards are derived from assumptions of a best estimate (neither overestimation nor underestimation) valuation practice, the principle of prudence is applied more widely than the best estimate

approach in many European countries. Whatever accounting standard is applied, a detailed analysis of reserve adequacy is required.
Following the economic approach, we must consider all reserve redundancies or deficiencies, directly impacting NAV. It means, that according to the economic approach the valuation of claims reserves should follow best estimate practice, ensuring the correct states of the outgoing balance sheet as of the date of appraisal.

Unearned premium reserves
Concerning premium deficiencies (when the earned premium from business in force is not sufficient to cover expected claims and expenses), some accounting standards (US-GAAP, IAS) require creation of premium deficiency reserves immediately after they are recognized. On the other hand, there are many other accounting standards (e.g. Czech accounting principles), which do not address this issue so precisely. The application of premium deficiency reserve means the direct recognition of expected future losses in the balance sheet against the decrease of NAV. That is fully consistent with the economic approach.

Equalization and catastrophe reserves
This item represents one of the most controversial points, on which different accounting bodies have not completely agreed yet. In many European countries, the insurers are still obliged (or allowed – depends on interpretation) to create equalization and other similar reserves in order to smooth the fluctuations in claims development.
But according to both leading accounting standards (US-GAAP, IAS), this type of reserve does not represent a certain liability and therefore is not booked as such. On the other hand, both standards, supported by the state regulation (solvency, RBC applications), argue that catastrophic risks are to be implicitly included in the required level of capital. In an economic approach to valuation, these items are not recognized as liabilities, consistent with US-GAAP and IAS. We must reclassify them as NAV in cases where they are booked as liabilities.

Solvency requirements
At the beginning, it is worth distinguishing between statutory solvency required by the state supervision and the required risk capital (risk solvency), resulting from the risk profile of an insurer.
First, as far as the statutory solvency requirement is concerned, it is for sure that any deficit in this respect must be fully considered in the determination of NAV. The required statutory solvency is very often lower than that one corresponding to the risk profile of an insurer, whose level should support continuing business under the defined probability of failure over a certain period. Once we determined the level of required risk capital, the negative gap as compared with current available capital must be fully reflected in the determination of NAV. We propose to deduct the whole capital deficiency from NAV of a target company in order to determine the acquisition price. The explanation for it can be found in the argument, that the total costs of an acquisition consist not only of the paid acquisition price but also the additional capital injections, which are necessary to cover undercapitalisation. In order to insure future profits (ongoing concern), the target company must be adequately capitally equipped. In other words, the acquiring company must provide the target company with additional capital to generate future profits from an acquisition. When we deduct the deficit in solvency from NAV (as a component of acquisition price) and consequently suppose capital increase (in fact another component of acquisition price), we are setting the consistent outgoing level of capital for cash flow projection. All the relationships concerning solvency requirements and their impacts on valuation are illustrated on the following figure.

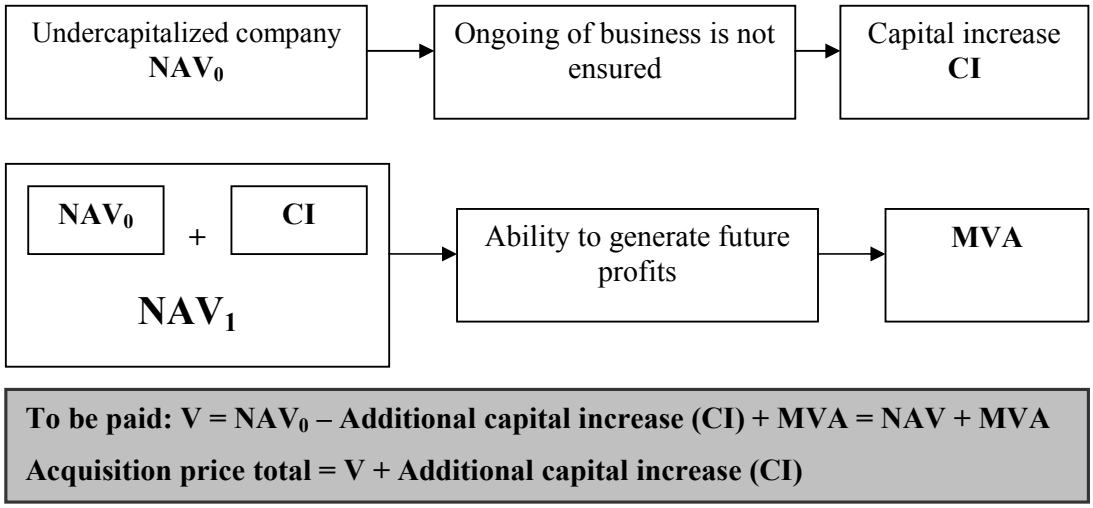


Figure 7: Solvency requirement considerations

Other operational deficiencies
If there are some deficiencies in the operational part of the target company, which in fact represent liabilities requiring future investments, and are not shown in the accounting statement, they should be reflected in the NAV determination according to the economic approach as well. The ongoing concern should be the criterion for recognition of operational deficiencies (the company's insufficient IT-infrastructure).

Elimination of goodwill
We are of the opinion that goodwill should be eliminated from the assets, when determining NAV according to the economic approach. Goodwill, in its theoretical sense, represents the ability of a company given by its staff, market position and operational and sales infrastructure to generate future profits. Of course, this ability matters in the valuation. But in our concept it is considered on another place - in the cash flow projection. If we kept the value of goodwill in NAV, we would count it twice (once under NAV and for the second time in cash flow projection).

Other market adjustments (cleaning of the balance sheet)
Under this item we understand all other analyst's adjustments, which are in line with the applied economic approach to valuation. They can result either from "creative" or else doubtful accounting, with the aim of cleaning the balance sheet as of the date of appraisal. For instance in the CEE region, the authors met with several cases of distrustful accounting, creating an artificial picture about business volume and so on. Therefore, it can sometimes prove very difficult for outsiders to become fully aware of the real economic sense hidden in the information provided by accounting.

Tax considerations
All above adjustments should be also considered with respect to their relevant tax impacts.

Summary of NAV determination (from accounting to the economic approach to valuation)
Equity (from statutory accounting)
+/- market adjustments to investment portfolio covering technical reserves
+/- market adjustments to strategic investments

- elimination of goodwill
+/- treatment of DAC
+/- market adjustments to other assets
+/- reserves adequacy of claims reserves
+/- reserves discounting
+/- premium deficiencies
+ elimination of equalization reserves
- solvency deficiencies
- other operating deficiencies
+/- tax considerations
NAV

5.2.2. Determination of Cost of Capital (CoC)

One of the most important inputs to cash flow projection is the appropriate rate at which future cash flows are discounted (Cost of Capital – CoC). Given the specific capital structure of P/C insurance companies (since premium is received in advance, there is no need for debt financing), the determination of CoC involves only the quantification of the cost of equity capital. CoC is to be interpreted as the rate required by investors to make an investment in the firm's equity. Investors' expectations with respect to risk and return are reflected in this input. From the managers' point of view, on the other hand, it represents the minimal return to be reached. Although the setting of the discount rate is always partly arbitrary in the valuation modeling, the majority of models are derived from the principles of the Capital Asset Pricing Model (CAPM). We introduce this basic concept of financial theory. After that, we address some issues specific to P/C insurance companies.

5.2.2.1. The CAPM

The Capital Asset Pricing Model (CAPM) is derived from the assumption that we can distinguish between firm-specific diversifiable risk and systematic (market) risk, which affects all investments in the market and cannot be diversified. The investor is rewarded only for systematic (market) risk, since firm-specific risk can be avoided through diversification.
The theoretical foundations for the CAMP were established by the paper written by H. Markowitz (24). Here, Markowitz presented the theoretical concept of portfolio diversification and thus gave birth to the modern portfolio theory. The CAPM itself is connected with three names of W. Sharpe (30), J. Lintner (23) and J. Treynor. They extended the Markowitz mean-variance model by introducing the beta factor (the risk premium as a function of beta).

According to the CAPM, the expected (required) return on security (investment) R_i is given by the sum of the risk free rate and the risk premium.

$$\mathbf{R_i = Risk\ free\ rate + Risk\ premium} \qquad \mathbf{(5.13)}$$

The risk premium depends on the systematic risk (= market risk which cannot be eliminated through diversification). It is the contribution of the security (investment) to the overall market risk, measured by the factor beta. It can be written as:

$$\mathbf{R_i = R_f + \beta * [\, E(R_m) - R_f \,]} \qquad \mathbf{(5.14)}$$

where: R_i = the required return on the security (investment)
R_f = Risk free rate
$[E(R_m) - R_f]$ = Expected market risk premium
$E(R_m)$ = Expected return on market portfolio
β = Beta of the security (investment), defined as the portion of the total market variance which is explained by the security (investment).

Replacing the required return on the security (investment) R_i by the rate of CoC, we can write:

$$\mathbf{CoC = R_f + \beta * [E(R_m) - R_f].} \qquad \mathbf{(5.15)}$$

We need three inputs to CAMP to determine the rate of CoC:

- **The Risk Free Rate**
  The risk free rate is the yield on a risk free asset. An asset is risk free if its expected return can be determined with certainty. The implication is that there is no default and reinvestment risk. Therefore, the risk free rate should be optimally calculated from government zero-coupon bond. Concerning the maturity of such a bond, both models use the short term yield on T-Bills and long-term yields on government bonds. We recommend that the maturity (duration) of the risk free asset should correspond to the duration of the cash flow of the investment. An acquisition valuation utilizes the yield to maturity of a long-term (e.g. 10-15 year) government zero coupon bond. If there is no zero coupon bond with the above characteristics available in the market, the payoff pattern can be decomposed as a series of zero coupon bonds.

- **The Risk Premium**
  The risk premium is the additional rate required by investors to invest in the market portfolio (in the original version of the CAPM it is understood to be overall wealth in the economy). It measures what investors, on average, demand as an extra return for investing in the market portfolio relative to the risk free rate. In practice, we usually estimate the risk premium by considering the historical performance of stock market indexes as compared to the yields on risk free assets. Since both the risk free rate and the yield on market portfolio implicitly include the effect of changing inflation rate, the historical risk premium is already net of inflation effects. We use a historical average over a long time horizon in the calculation. The geometric mean seems to be more appropriate than the arithmetic mean. Generally, the risk premium is assumed to be in the range of 6%-8%[11].

- **Beta**
  Beta measures the risk that the investment adds to the market portfolio. Beta of an asset is defined as the covariance of the asset (R_i) with the market portfolio (R_m) divided by the variance of the market portfolio.

[11] For instance, in the case of determination of CoC for a P/C Insurer from the developing countries (e.g. CEE region) we can face the problem of no available transparent historical data for the calculation of market risk premium and insurance betas. Here, we can either use one of the modified approaches for developing economies or the information provided by rating agencies (risk premium resulting from country sovereign rating) or our own analyst's estimation.

$$\beta = \text{cov}(R_m, R_i) / \text{var}(R_m) = \text{corr}(R_m, R_i) * \sigma(R_i) / \sigma(R_m). \quad (5.16)$$

It tells us what portion of the total market variance is explained by the respective asset. It is clear that the higher the correlation between the respective asset and the market portfolio[12] and the higher the standard deviation of that asset, the higher the amount of systematic risk which is inherent in that investment as compared with the overall market.
In the CAPM, the risk premium for an investment is captured by the beta factor. Beta is usually estimated by regression of historical data.

In summary, when:

- $\beta > 1$: the asset is characterized by higher fluctuation than the market portfolio, is thus more risky, and the investors require a higher return than on the overall market portfolio,
- $\beta < 1$: the asset is characterized by lower fluctuation than the market portfolio, is thus less risky, and the investors require a lower return than on the overall market portfolio,
- $\beta = 1$: the asset is characterized by the same fluctuation as the market portfolio, and is as risky as the market portfolio.

Criticism of the CAPM

Recently, several objections have emerged to the standard version of the CAPM. They concern both the practical evidence and its theoretical foundations. There are several studies in the financial literature denying the empirical validity of the CAPM (e.g. market anomalies such as size effect, January effect, etc.[13]). Concerning the theoretical foundations, academics argue that the static (single-period) CAPM does not fully address the issues. This criticism resulted in Merton's intertemporal CAPM[14] and the consumption CAPM of Breedon[15].

An alternative theory to the CAPM is represented by the Arbitrage Pricing Model (APT). The theoretical foundations of the APT were established in the paper of S. Ross (28). Like the CAPM, there are two sources of risks: firm-specific (diversifiable) and market (systematic, undiversifiable). The expected risk premium is affected by undiversifiable risk. While there is only one source of market risk captured in the market portfolio in the CAPM, the total risk premium under the APT consists of multiple risk premiums, each one relating to a specific market risk exposure.

Despite all the objections, the key contribution of the Capital Asset Pricing Model (CAPM) is that it provides an insight to the relationship between required return and risk. It recognizes that only market (systematic, undiversifiable) risk matters. The distinction between diversifiable and undiversifiable risk, as the basic underlying assumption of the CAPM, has a timeless validity.

[12] It implies the smaller diversification effect by adding the asset to the market portfolio.
[13] For instance, see the work of Fama E.F., French K.R.: Size and Book-to-Market Factors in Earnings and Returns; Journal of Finance 50, 1995. They showed that stocks of small companies and those with a high book-to-market ratio reach above average returns.
[14] Merton R.C.: An Intertemporal Capital Asset Pricing Model; Econometrica, Vol. 41, No. 5, September 1973.
[15] Breeden D.T.: An Intertemporal Capital Asset Pricing Model with Stochastic Consumption and Investment Opportunities; Journal of Financial Economics, September 1979.

Currently, the CAPM represents the standard and most widely used model for measuring market risk in practice. Because of its elegance and simplicity, it is also widely accepted among practitioners in the P/C Insurance industry.

5.2.2.2. Applications to the P/C Insurance Industry – Selected Issues

The following questions are a big concern to actuaries.

- What should the required rate of CoC be for the P/C insurance industry?
- What is the riskiness of the P/C insurance companies as compared with other corporations?

There are no unique answers to these questions. On the one hand, we find arguments justifying a higher rate of CoC, assuming that P/C insurance companies are more risky because of their long tailed business, catastrophic risks, and lower transparency to investors. On the other hand, the analysis of historical betas refutes these arguments. This issue is not completely solved either in theory or in practice. However, we believe there is no systematic reason to treat the determination of CoC in a completely different way than in other industries. This statement is in line with our thesis that the higher or lower riskiness of the P/C insurance industry should be considered primarily in the appropriate amount of risk-adjusted capital. The implications are as follows:

Risk profile $\Rightarrow$ Risk adjusted capital $\Rightarrow$ Required rate of return (CoC).

With regard to the application of the CAPM in the P/C insurance industry[16], we briefly address the following issues, which are often discussed among the practitioners:

- **Insurance Betas**
  We generally assume that the beta of the valuated company is the same as the industry beta. Nevertheless, we must keep in mind that such a simplification neglects the differences in the risk profile both on the investment side (asset risks) and the underwriting side (underwriting risks). Generally, the betas for the P/C insurance industry are estimated to be less than 1.

- **The LOB Specific Discount Rate**
  In some valuation models, we meet with LOB specific discount rates, reflecting differing risks by LOB. Recalling the implication of the previous paragraph, Risk profile $\Rightarrow$ Risk adjusted capital $\Rightarrow$ Required rate of return (CoC), we prefer to apply the same rate of CoC across the entire firm. First, we consider only the systematic risk of the particular LOB in the amount of risk-adjusted capital. Thus, the riskier LOB implies a higher amount of required capital and a higher expected (required) profit margin. Then, the risk-adjusted profitability is compared to the benchmark of the CoC for all LOB. This procedure is fully consistent with the EVA-based valuation approach. Here, the item costs of holding capital, as a product of CoC and risk-adjusted capital[17], implicitly include the riskiness of a particular LOB.

Conclusion

[16] For further discussions, we are refering to Felblum S., Thandi N.: Financial Pricing Models for Property-Casualty Insurance Products: The Target Return on Capital; CAS Paper, 2003.
[17] As a remark, we assume that the invested capital is allocated to LOB on a risk-adjusted basis.

The rate of CoC is the critical input in any DCF (EVA) based valuation. It represents the discount rate of future cash flows. In an EVA-based valuation, the alternative costs of holding capital are reflected in this input. Although its determination follows a particular theoretical concept, usually CAPM, the resulting rate is always arbitrary and is influenced by subjective factors as well. Many questions specific to the business of insurance arise in an application to the P/C insurance industry. For this reason, the rate of Cost of Capital and its individual components should be analyzed very carefully and tested by sensitivity analysis. Small changes in this parameter substantially impact the range of possible outcomes.

5.2.3. Cash Flow Projections

Cash flow projections together with CoC determine the second component of an EVA-based valuation approach termed Market Value Added (MVA). MVA is defined as the sum of projected profits net of costs of holding capital at discounted values. MVA can be a substantial part of the acquisition price value. The calculation consists of explicit cash flow modeling and determination of terminal value, which is discussed later in this paper.

$$V = NAV_0 + MVA = NAV_0 + \sum_{t=1}^{T} \frac{EVA_t}{(1+CoC)^t} + \frac{EVA_{T+1}}{CoC * (1+CoC)^T}.$$

We will focus on the most important aspects of the cash flow projections of P/C Insurers. The projection of cash flows sets a higher modeling standard than, as an example, the determination of NAV, which is influenced mainly by the accounting methodology and the scope of the particular economic approach.

The analysis of cash flow projections starts with two basic assumptions:

1. Ongoing concern. The assumption that the entity will run its business as an ongoing concern has a basis in the purpose of the acquisition valuation.
2. Consistency. The cash flow projections should be consistent with the NAV determination with respect to the valuation principles, e.g. economic approach vs. accounting standards.

For an ongoing concern, the future cash flows can be divided into:

- Run-off of existing business
- Future business

What are the crucial issues with respect to run-off business? Recall how NAV was derived and all the factors included in the economic approach. The runoff of existing business is substantially influenced by the extent to which the economic approach is utilized in the NAV determination. For instance, if we utilize a clear economic approach including the discounting of reserves, then the runoff of existing business, except for the unearned premium reserve[18], would already be fully considered in NAV. However, as we have said before, the application of a clear economic approach does not always fit the needs of practical valuation modeling. For that reason, we are precise in following the exact appraisal principles of NAV determination.

[18] Depends on interpretations. Under certain circumstances, run-off from unearned premium reserve can be understood only as an application of accrual principle in accounting (matching). So, the economic sense behind that is slightly different from the run-off of claims reserves.

The run-off of existing business consists of the following two items:

- Run-off of unearned premium reserve. Unearned premium reserve (UEP) represents the deferral of written premium, according to pro-rata temporis. The release of UEP is related to the incurred losses in that the incurred loss is written as a claims ratio to earned premium in the cash flow calculation. The calculation includes operational expenses and the release of DAC. Investment income is included since it is generated from assets covering both unearned premium reserve and claims reserves. The projection of UEP run-off should be in line with all premium deficiencies / redundancies in the NAV determination. In other words, UEP run-off can be seen as a matching concept in the accounting.

- Run-off of claims reserves. The discounting of reserves is a key parameter in the run-off of claims reserves[19]. The value of the run-off equals zero if the discounted reserves are best estimate values since realized investment income is offset by the amortization of the discount. If the claims reserves are undiscounted, the run-off consists of the investment income that the assets supporting the undiscounted claims reserve yield. We assume the reserves are set up correctly.

The tail of the run-off of existing business is of crucial importance for cash flow projection. The long-term nature of the insurance business necessitates that the analyst examine the impacts of variables such as inflation, claims inflation, or interest rates on the run-off of the reserve.

We now explore the various aspects of cash flow projection taken into consideration when creating the appropriate valuation model.

5.2.3.1. Scenario Testing vs. Stochastic Analysis

The first question to address is whether to calculate cash-flow projections based on scenario testing, stochastic analysis, or a combination of both. There are many studies discussing the advantages and disadvantages of both approaches with respect to the objectives of the applications (e.g. for details see Feldblum (17), (23)). We briefly describe the relevance of the issue to valuations.

Scenario testing represents the deterministic approach to modeling, where static set of input variables is used. The sets of input assumptions are determined by an analyst as reasonable scenarios of the future development. Therefore, the mutual consistency between inputs is of a great concern. We can use a deterministic model to answer: "What happens, if …?" questions. Furthermore, the extensions by sensitivity and stress testing are of a big contribution.
The authors of (23) summarized the main advantage of deterministic scenarios as follows: "One advantage of deterministic scenarios is that they can be tailored to reflect management's judgment and develop a consistent, plausible expectation about the future. Therefore, it is important that the economic variables describing the scenario be consistent with each other and with the underwriting and other variables, as well."

[19] Besides the ex-post adequacy of claims reserves resulting from the stochastic character of the insurance process.

Stochastic analysis, on the other hand, uses variables that are selected randomly from probability distributions. It enables you to quantify some function of the variables, such as probability distribution of profit, NAV and so on. When using stochastic analysis, we must pay close attention to the correct set of interrelations between variables.

What conclusions are to be taken concerning scenario testing and stochastic analysis in respect to the valuation purpose?
It is clear that stochastic analysis can provide some pieces of information (e.g. probability distributions), which we cannot obtain from scenario testing. On the other hand, the necessity of correct and consistent inputs is much higher in stochastic analysis. That is the key assumption. If it is fulfilled, the application of stochastic analysis for valuation of P/C Insurers can be very useful. Otherwise, when this assumption is not fulfilled, the results from stochastic analysis could lead to some misleading conclusions.

In our point of view, there are always some limitations concerning the access to correct data and their correct interpretation in the acquisition valuation process (**possible information deficit of an analyst**). Based on this thesis, we would prefer to base the valuation modeling on the scenario testing approach with the maximum attention paid to the sensitivity analysis of key actuarial and financial parameters. We find this way as a safer one, eliminating the risk of "garbage in, garbage out". In other words, it is no black box for an analyst. Furthermore, the acquisition valuation is more sensitive to and more influenced by strategic inputs. The inputs are, by definition, of a psychological nature and the contributions of stochastic analysis could be eliminated to a certain extent.

Other factors influencing the selection of a correct valuation model include the availability of data, the transparency and reliability of data, historical time series, transparency of definitions used, and so on.
In summary, the consistency of inputs as well as the setting of correct relationships between them belongs to the highest principles, which are subordinated to others. When creating a valuation model (either deterministic or stochastic), there must be always considered the harmony between the quality of available data and the requirements for complexity of a valuation model as the highest priority.

5.2.3.2. EVA Time Horizon and Terminal Value

The selection of the time horizon over which EVA is explicitly estimated should take into account, on one hand, the long term character of insurance process, where the payout pattern of claims reserves is of a crucial importance and the analyst's ability to set correct assumptions for the far future, on the other hand.
Generally, in the insurance industry the rule is that the explicit cash flow modeling is reasonable up to 15-20 years. Above this level, all assumptions are becoming too speculative, so the determination of terminal value comes into question. However, within this 15-year level of explicit modeling we would also recommend identification of the initial phase over which some aggressive assumptions (e.g. growth rates, synergy effects) are acceptable. We are of the opinion, that this initial phase should not exceed 5 years, as the period over which the assumptions can be estimated with the highest correctness. Then, the inputs during the second phase should be assumed in a more conservative manner.
In this respect, we recommend establishing a controlling mechanism, such as the positive gap between ROE and CoC. This gap should decrease towards the end of the modeled horizon.

As already mentioned, the EVA based valuation approach offers a very elegant treatment of the terminal value.

We assume that after a long time period, e.g. 15 years, there is no reason that the return on equity should exceed the cost of capital[20]. In other words, the company will operate at a level of profitability equal to CoC. Under this assumption, the terminal value equals zero.

$$\mathbf{ROE = CoC \Rightarrow EVA = 0 \Rightarrow TERMINAL\ VALUE = 0} \qquad \mathbf{(5.17)}$$

Terminal value is often overestimated in the acquisition price when the valuation follows a traditional DCF approach. Following (5.17), we can be sure of no overestimation of the terminal value in an EVA based approach.

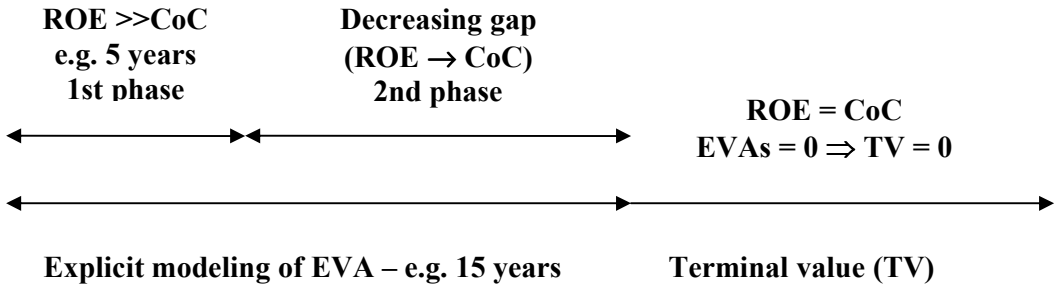


Figure 8: Periods of cash flow modeling (an example)

5.2.3.3. Inputs to Cash Flow Modeling

Once we decide on the valuation model and the time horizon of the model, we shift to the identification of inputs to the cash flow projection. Inputs are categorized by the general economic environment, legal and political stability, industry specific factors and developments in the insurance market, and company specific factors. Figure 1 in Appendix A illustrates this point.

Each level of this hierarchy requires different data sources and also different treatment in respect to impacts and consequences for valuation. This classification (hierarchy) also corresponds to the scope to which the inputs are controllable and influenceable by the acquiring company in the middle, respectively long term. While the first three classes of factors are to be understood as externally determined and therefore uninfluenceable (by industry-specific factors under the assumption of complete competition in the insurance market), the last group of inputs – company-specific – can be in the middle term to a certain extent controllable and manageable by the management of the company.

1. Factors of macroeconomic development

Generally, the insurance industry belongs to the most exposed sectors to macroeconomic development. The variables such as inflation, risk free rate, term structure of interest rates, stock market index, growth of GDP and so on can substantially influence the characteristics of both existing and future business. Taking into account the long-term character of the

[20] This assumption results from the application of efficient market hypothesis (see chapter 4.3 for details).

insurance business, even small changes in any of those parameters matter. For that reason, it is necessary to implement into the valuation model the relationships between economic variables and underwriting and investments parameters. The valuation model should at least embrace the following interrelations. There is usually a close correlation between inflation and risk free rate. Risk free rate determines through the yield structure of interest rates the investment income and through Cost of Capital the discount rate. On the other hand, inflation correlates to claims inflation, as a parameter impacting on the ultimate value of claims reserves. Furthermore, stock market index is in the long term determined by nominal growth of GDP, consisting of its inflationary and real component. Next, the investment yield on stocks influences the rate required by investors to make an investment – Cost of Capital and so on.

Putting together all key interrelations, we should be prepared for answering questions: "What happens, if …". For that reason, a detailed sensitivity analysis is needed, under the assumption that the established relations between key variables are also a subject of uncertainty and should be tested on sensitivity as well. Moreover, stress testing on some extreme developments (long recession, deflation, inflationary shocks, etc.) could identify some too large risk exposures.

2. Factors of external legal and political development

The perceived stability in respect to legal and political development significantly influences how the country is appreciated among the potential investors. Among others, this aspect determines the country risk premium (e.g. according to rating), as a component of Cost of Capital. With regard to valuation, we recommend testing the impacts of changed risk premium on the present value of future cash flow. Furthermore, it is advisable in the case of the developing economies to consider the possibility of extreme events (e.g. political instability), implying the application of stress testing.

3. Factors of insurance market development

For the cash flow projection industry-specific inputs are very important as well. Here, we point out the expected growth of total insurance market (insurance penetration - total premium as % of GDP), setting restrictions and limitations for applied growth rates. Furthermore, the prediction of insurance market structure could provide us with some necessary inputs when projecting growth rates on the level per lines of business. In some models, there are also incorporated the characteristics concerning underwriting cycles (hard vs. soft market). Finally, we should also take into account less quantifiable factors such as trends in the state regulation, integration of financial services and so on.

4. Factors of valuated entity

The first task regarding company-specific factors consists of the identification of the inputs to be considered in the valuation model. The relevant classification could follow the two-dimensional basic hierarchy. First, the insurance process and its particular components represent one criterion for classification. According to that, we could distinguish the following areas of company-specific inputs:

- Analysis of premium assumptions $\Rightarrow$ premium module
- Analysis of expenses assumptions $\Rightarrow$ expenses module
- Analysis of claims assumptions $\Rightarrow$ claims module

- Analysis of investments assumptions ⇒ investments module

The next criterion for classification results from the subject setting the assumptions. Here, we must explicitly treat the **strategic inputs** (to be delivered by management) as compared with the **underwriting / financial inputs** (responsibility of actuaries and financial analysts). Strategic inputs, as discussed in Section 3, have connections mainly to premium and expenses (respectively claims) modules:

- Growth rates above market level
- Growth rates vs. claims ratio assumptions
- Synergy/diversification effects
- Growth synergy
- Economy of scale
- Embedded options

Every valuation model should start with the **premium module**, where the assumptions concerning growth rates of premium per lines of business would be the covering output. The growth rate of the premium should be in the next step broken down into the growth rate of number of new business, the growth rate of average premium of new business, the average growth rate of premium in the portfolio (valorization rate) and the cancellation rate (portfolio outflow). Furthermore, the assumptions about payment pattern are beneficial. The premium module should be also linked to industry-specific factors (growth of market premium etc.).
With the premium module are very closely connected the parameters of **expenses**. Usually, the expenses are modeled separately for commissions, other acquisition expenses (both are modeled as variable ratios related to written or earned premium) and operational expenses, which need to be divided into fixed and variable parts. Just in the fixed part of operational expenses we can identify together with the applied growth rate of premium the effects of economy of scale.
The **claims module** includes besides the claims ratio of accident / calendar years also the modeling of run-off of claims reserves and the assumption about payout pattern. It is advisable to link the ultimate value of reserves to claims inflation (see connections to macroeconomic factors).
Finally, the **investment module** should be completely connected to the macroeconomic module. It includes CoC calculation, projection of investment yields per investment classes, portfolio structure and reinvestment rules.

The sources for company-specific inputs are predominantly:

- Analysis of historical performance (development, trends, etc.)
- Risk portfolio analysis (underwriting, investment and operational risks)
- Analyst's expectations

Implementation of cash flow model

Once we have identified key factors influencing cash flow projection, we must put them together and build up a valuation model. Whereby the setting of relationships and interdependencies poses the most significant requirement. Here, the feasibility of selected dependencies is of a crucial importance. Typically, the whole model of a P/C Insurer consists of the consecutive dependencies creating a modular construction, where the first variable influences the second one which is connected to the third one and so on (for example, see Figure 2 in the Appendix A). Next, by setting the relationships between variables, it is worth keeping in mind their implied consequences on the total result. On the one hand, there are

factors whose impacts on the total result are due to dependencies and relationships partly compensated and thus reduced by the opposite change in other factors. On the other hand, a change in one parameter can cause the consecutive changes in other parameters affecting the result predominantly in the same direction (dependencies even multiply the initial effect). In order to be sure that the model works as we intended, it can be a good logical exercise to anticipate all the effects resulting from an initial change in one parameter. In our point of view, an analyst should always be able to intuitively foresee the impacts of any change in underlying assumptions on total result (we are speaking about deterministic model). Otherwise, the valuation model, despite its deterministic character, is becoming a very difficult controllable "black box" with the implications on its credibility.
Consequently, we also recommend setting up some checking mechanisms on the level of respective modules and dependencies between them. For instance, they can be in the form of difference ratios, such as the difference between projected premium growth rate and market growth rate (check of adequacy of applied growth rates), the gap between ROE and CoC or the difference between premium growth and growth rate of expenses (effect of economy of scale).

Finally, we must establish several output sheets in the valuation model, serving for the presentation purpose:

- P&L statement
- Balance sheet
- Key financial indicators (solvency and capital requirements, NAV, internal rate of return, etc.)
- Overview of main valuation assumptions etc.

5.2.3.4. Scenario Testing and Sensitivity Analysis

At the beginning of this chapter, it is worth remembering that we suppose the exclusive application of deterministic modeling. Based on the completed valuation model with all the variables and interrelations, we start constructing various scenarios.
The main advantage of scenario testing consists in the possibility of reflecting several analysts' respectively management's judgments concerning future development. That is under the assumption that the variables are in each scenario consistent with each other (macroeconomic, underwriting, investments variables etc.). Generally, the selection of scenarios should consider the environment in which the insurer operates as a whole. It should reflect the reasonable expectation about future development. The analysts must ensure the feasibility of assumed interactions between variables. For example, an increase in interest rates would not be probably in line with the decrease in discount rate (CoC) and so on. Due to the character of deterministic modeling (partly subjective determination of scenarios), there is a risk of either too favorable or adverse set of assumptions. For that reason, different scenarios are to be prepared, ranging from optimistic to pessimistic alternatives. On the other hand, in order to keep the valuation study sufficiently effective and manageable, it is practical to work with the limited number of scenarios (e.g. maximally 5 scenarios).

First, we start with a **base-case scenario** as an outgoing base for further alternative scenarios and sensitivity testing. The base-case scenario consists of the most probable valuation inputs concerning expectations about future development, with the primary focus on the mutual consistency between the variables. The inputs to base-case scenario are determined according to best estimate practice. In the next step, it is recommended to develop also the **worst-case scenario** as the combination of several adverse but still reasonable assumptions, in order to

explicitly present the extreme range of possible outcomes and to warn against potential dangers of an acquisition. In addition to base case scenario, we continue building up additional (3, 4) **alternative scenarios**, consisting of alternative selections of one or more particular variables and their particular values. We are of the opinion that the application of alternative scenarios comes into question mainly in the case of analysis of various strategic inputs. For example, we can explore the effects of changed growth rates, synergy effects, claims development or CoC. The reason behind that is to draw the attention of the decision makers to the impacts of some crucial (e.g. strategic) assumptions, pointing out the uncertainty inherent in the valuation.

While different alternative scenarios should embrace several simple modifications of base-case scenario reflecting the analyst's judgments about the potential changes in assumptions (mainly strategic inputs), the contribution of **sensitivity analysis** offers the possibility of going further into detail, without loosing the necessary transparency and clarity with regard to presentation purpose.
Not only analysts, but also decision makers, should be interested in the issues what happens if something other happens. In order to answer this kind of questions: "What happens, if …?", we must adjust the model for applications of sensitivity testing, which is usually linked to base-case scenario.

We see the main contributions of sensitivity analysis for the valuation of P/C Insurance companies:

- To emphasize that the outcomes of the valuation models are dependent on the particular set of assumptions; if they are changed, the results are also different; there is either "no correct" or "no wrong" outcome. The importance of selected valuation assumptions is to be always pointed out.
- To highlight the uncertainty inherent in the valuation.
- Consistent with the stochastic and long term character of insurance business.
- The possibility of identifying key value drivers, as the variables mostly affecting the results.

We should test the sensitivity on at least the following areas of inputs and their respective components:

- Premium growth rates (new business, avg. premium, cancellation rate)
- Claims development (accident claims ratio, run-off result, payout pattern, claims inflation)
- Expense ratios (commissions, other acquisition expenses, fixed vs. variable part of operational expenses, economy of scale)
- Discount rates (CoC, risk free rate, risk premium)
- Investments yields (yield structure of interest rates, risk free rate, inflation rate, stock market index)

Sometimes it cannot be satisfying to test the variables under the fixed interdependencies. It can be also very beneficial to test the sensitivity of a variable, while isolating the related effects on other variables (other variables are kept constant = no interdependencies). Based on this, we can eliminate the combined effects from the model and explore separately the change in one parameter, without affecting others. On the one hand, we can test the change in inflation rate including the corresponding effects on risk free rate, interest rates, investment income, CoC, claims inflation and ultimate values of claims reserves and so on. On the other

hand, we can exclude all the relationships and test the change in inflation only in relation to claims inflation affecting ultimate values of claims reserves.

As already mentioned, one of the conclusions from sensitivity analysis should be the identification of **key value drivers** (NAV, CoC, growth rates, synergy, diversification and control effects and so on), which substantially impact the determination of final value.

Finally, we can implement into the valuation study the appendix to sensitivity analysis - **stress testing** – consisting of selecting several extremes, but still reasonable, assumptions about future development and the potential impacts on the insurer.

5.2.4. Decomposition of the Acquisition Price

After we have prepared several scenarios and tested key variables for sensitivity, comes the question whether the results are reasonable and plausible. We should start analyzing the acquisition price with the following questions.

- Do we understand the outcomes of the valuation model?
- Are they in line with our expectations?
- How can we appreciate that the resulted outcomes (acquisition price) are adequate?

One of the possible solutions can be to break down the acquisition price into the particular components and then all the components appreciate separately step by step. It enables better understanding of the sources that generate the acquisition price (value).

The primary decomposition of acquisition price is already defined by the basic equation of the EVA-based valuation approach.

$$V = NAV_0 + MVA = NAV_0 + \sum_{t=1}^{T} \frac{EVA_t}{(1+CoC)^t} + \frac{EVA_{T+1}}{CoC * (1+CoC)^T}$$

According to that, we distinguish between:

- NAV, as the difference between (market) values of assets and liabilities. It represents the state of invested capital as of the appraisal date.
- Discounted values of future profits net of costs of holding capital (MVA), consisting of the period of explicit modeling and the terminal value.

Already this basic decomposition can reveal some key connections. It is certain that the first component – NAV – is the safer one with respect to the adequacy of the acquisition price. MVA, on the other hand, is created to a large extent by expectations about the future development. It is worth emphasizing, that there are no recommendations what should be the correct portion of value of "positive expectations about the future" – MVA. However, we should analyze the adequacy of MVA as related to the total value (V = NAV + MVA) very carefully. The higher the share of MVA, the more aggressive the acquisition seems to be.

Nevertheless, we can do a small logical contemplation. Let us suppose the case of distributed profits and infinite horizon with the same assumptions concerning ROE and CoC over the whole infinite. We are interested in the relationship between ROE and CoC and the corresponding impact on the proportions between NAV and MVA on the total value (V).

Going out from equation (5.7), we can easily prove that:

$$MVA = NAV * (ROE - CoC) / CoC. \quad (5.18)$$

Substituting the term NAV from (5.18) into (5.8) yields:

$$\mathbf{MVA / V= (ROE - CoC) / ROE.} \quad \mathbf{(5.19)}$$

Following the equation (5.19), the share of MVA on the total VALUE (V) is given by the excess of ROE above CoC as related to ROE. For given CoC = 10%, we can illustrate this dependency on the following graph.

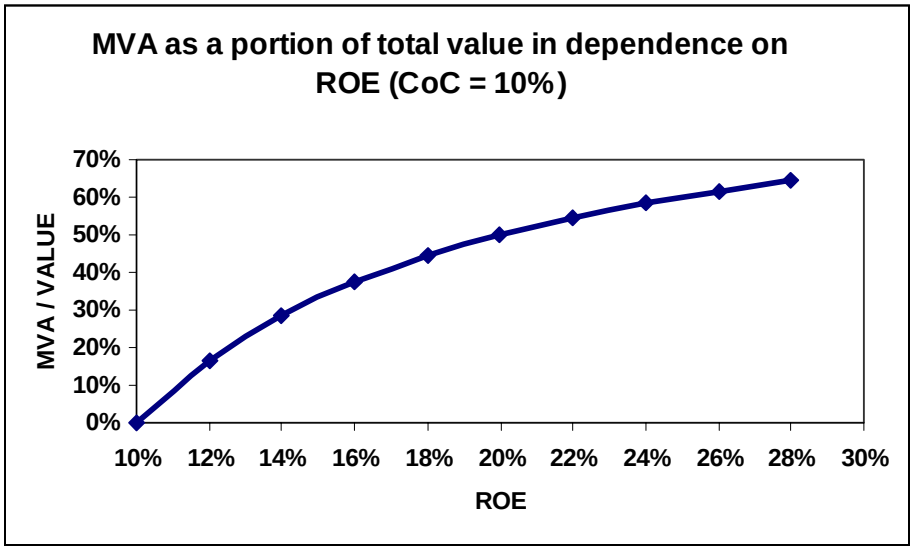


Figure 9: Dependency between the portion of MVA on the total value and ROE (CoC = 10%)

You can see that the share of MVA on the total value (NAV + MVA) exceeds 50% if the projected ROE is higher than 20%.
This example clearly illustrates the connection between the high share of MVA on the total value and the corresponding positive expectations about the future, as embodied in the projected ROE ratio. It is up to analysts to appreciate whether the portions of MVA are still realistic or not. See also Appendix C illustrating the value in dependence on ROE and CoC for 15-year and infinite horizon.

In the next step, we can further break down the value of MVA according to the valuation process as described in Section 3.3:

- Status quo valuation
- Valuation of synergy / diversification effects
- Valuation of effects of control
- Valuation of embedded options

It means to explicitly model all the assumptions concerning synergy / diversification and control effects and to follow all the consecutive steps (for details see chapter three). Then, we could decompose MVA into:

- Value based on status quo valuation
- Synergy / diversification acquisition premium
- Control acquisition premium
- Value of embedded options

There is always a danger that a high acquisition price is justified by high weights of synergy / diversification and control acquisition premium and value of embedded options. Thus, such a decomposition should provide detailed insight into this issue in order to avoid either too positive expectations or any double counting of key items (e.g. high growth rates are considered both in the status quo valuation and in the overestimation of synergy effects). For that reason, a careful discussion about the structure of acquisition price is necessary.

5.2.5. Application of other Valuation Methods

Although the valuation modeling is usually based on the DCF (EVA) approach, the final acquisition price is in practice always compared with benchmarks given by either relative valuation or stock market approach. For that reason, a simple application of both is beneficial. It could provide us with some important information about the adequacy of acquisition price, as well. For details see Section 4.

5.2.6. Presentation of Outcomes

The last section of the valuation process is to be devoted to the presentation of outcomes. The analysts should not in any case underestimate this point. Without trying to present here the comprehensive issue, the set of information provided to decision makers with respect to valuation process should include the following parts:

- Summary of key assumptions on which valuation was based
- Risks inherent in valuation
- Presentation of selected scenarios (in the form of simplified P&L and overview of key financial indicators)
- Presentation of conclusions
- Recommendations to Board of Directors

6. Summary and Final Considerations

6.1. Summary

In the presented paper, we tried to capture the whole issue of acquisition valuation of P/C Insurance companies as comprehensive as possible. The paper was aimed at analyzing the acquisition valuation of P/C Insurers from different perspectives, whereby some aspects were only roughly suggested, without going too much into detail. We did not wish to present the next in a long line of other already existing actuarial models of the P/C insurance business. On the contrary, the presented study can be complementary to those models. It should provide actuaries with different insights into this topic from various perspectives, which are not so often discussed in the actuarial profession. The paper should serve as a theoretical background, combining both the knowledge of corporate finance and economics of P/C Insurance. Moreover, we tried to balance theoretical and practical aspects, whereby sometimes we only outlined the practical implications and consequences and let on the reader, if interested, to explore a particular problem more deeply. Our approach was primarily derived from the financial perspective, on which the actuarial models should build up.

In the first part, we discussed the specifics of the P/C Insurance business with the aim to define, besides other generally accepted financial principles to valuation, the basic playground for the valuation of P/C Insurance companies. Subsequently, we explored the strategic part of the acquisition process, highlighting the importance of synergy, diversification and control effects. Here, we emphasized the appropriate conclusions and consequences for valuation modeling. Then, the short description of basic valuation methods, as applied in corporate finance, was conducted with the conclusion to base our valuation approach on the EVA principles. After comprehensive theoretical introduction, we dealt with two components of EVA-based valuation: determination of Net Asset Value (NAV) and cash flow projection (MVA). Here, the connections to either applied accounting methodology vs. economic approach to valuation were discussed, with the focus on consistency between NAV determination and cash flow projection. Finally, we explored different aspects of cash flow modeling. This paper concludes with some final considerations.

6.2. Final Thoughts about Limitations of Valuation

It is for sure, that there is no unique valuation approach for P/C Insurers. There is no "the only correct" approach. There is no "completely wrong" approach. Nevertheless, we could summarize several principles to be fulfilled, whatever valuation approach (model) is concerned.

1. Reflection of investors' point of view
2. Reflection of specifics of P/C insurance business
3. Reflection of strategic aspects
4. Preference of economic approach
5. Conservatism concerning future development
6. The consistency of a model matters
7. Clarity and transparency of a model is subordinated to its complexity
8. To emphasize the assumptions on which a particular result is based
9. There will be always a large piece of uncertainty
10. To keep "the big picture"
11. Reflection of outsiders' point of view

12. No model can foresee future
13. Logic and managerial intuition will always play an important role

Furthermore, we must be aware that every valuation process runs in the real time under the current external environment. It can substantially influence the expectations, as one of the key determinants of valuation inputs (time-dependency of valuation). Therefore, the appreciation of the same fact can vary at different periods completely. Valuation will be always partly subjective and will bring different outcomes depending on concrete personalities of analysts and decision-makers. With regard to the determination of final acquisition price, we are pretty sure that just the inputs determined by expectations and other strategic aspects are more important than any other (actuarial) assumptions. In addition, to avoid any misunderstanding and misleading interpretations, every valuation should strongly emphasize its underlying assumptions, which can be very changeable over time. We are convinced, that this changing environment is becoming more and more important in the areas, which has been found up to now as quite deterministic and predictable.
To sum up, we must always keep in mind the uncertainty (undeterminability) of external environment concerning future development. This fact, on the one hand, gives reasons for the existence of insurance industry as a risk transformer, but on the other hand implies the uncertainty inherent in the valuation. Whatever the detailed valuation model, we cannot by definition embrace the whole complexity of external world. However, there are still remaining some principles that are timeless.

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Glossary of Key Terms

Actuarial / financial part of valuation process: Following the strategic part, it includes analysis of actuarial, financial and investment valuation inputs and their appropriate reflection in the valuation model.
Book value approach: The value of a company is arrived at by analyzing accounting statements, whereby different adjustments of particular items can be made to better reflect the market environment.
Control effects: They are given by additional positive value from restructuring of poorly managed firms.
Cost of capital (CoC): Given the specific capital structure of P/C insurance companies, the determination of CoC involves only the quantification of the cost of equity capital. CoC is to be interpreted as the rate required by investors to make an investment in the firm's equity. At this rate future cash flow is discounted and thus investors' expectations concerning risk vs. reward tradeoff are reflected.
Discounted cash flow approach (DCF): The leading principle of DCF is the rule of present value. The value of any asset is determined by the present value of the expected future cash flow.
Diversification effects: There are given by the reduction of volatility.
Economic approach to valuation: The long-term, prospective approach to valuation, which reflects both the current market environment and investors' point of view. The economic approach should generally extend the accounting information using the analyst's best estimate adjustments and other factors that need to be taken into consideration to correctly reflect the investors' point of view.
Economic Value Added (EVA): EVA is defined as Profit after Tax (PaT) earned on invested capital and adjusted by the costs of holding capital, reflecting investors' opportunity costs.
Embedded option: See Real option.
Equity: The book value of equity, as reported in the accounting statements, results from the application of valuation principles to insurance assets and liabilities according to particular accounting standards (see Valuation according to accounting principles).
EVA based valuation: Derived from the principles of DCF, the value of a company is determined by the sum of invested capital (NAV), as the difference between the (market) values of assets and liabilities, and by the discounted excesses of future profits (MVA).
Investors' point of view: The valuation based on investors' point of view primarily goes out from the thesis that the companies are running their businesses with the objective of maximizing shareholder value from the long-term point of view.
Market Value Added (MVA): MVA is defined as the sum of discounted future EVAs.
Net Asset Value (NAV): In comparison with the accounting term of equity, the determination of NAV, as the difference between (market) values of assets and liabilities, points out current market environment as well as other factors, which need to be taken into consideration to correctly reflect investors' point of view. NAV is determined by the economic approach (see Valuation according to economic approach).
Option Pricing Theory: If the investment embodies a strategic option such as flexibility to expend a project, to postpone additional expansion or to abandon a project, the value of such an option (see Real option) should be deduced from Option-pricing theory.
Real option: Traditional DCF -based valuation methodologies may fail in including of some strategic aspects, which are embedded in the investments, such as flexibility to expend a project, to postpone additional expansion or to abandon a project. Since the underlying assets are represented by real investments (business opportunities), we speak about real options

(embedded options). Because of the similarity to financial options, their valuation follows Option Pricing Theory.

Relative valuation: It goes out from the principle that the value of a company is derived from the value of a comparable company. It utilizes standardized variables such as earnings, book value, profits, and sales.

Stock market approach: Following efficient market hypothesis, the value of a company is determined by the price at which its shares are being publicly traded.

Strategic part of valuation process: It includes analysis of motives behind an acquisition, its possible synergy, diversification, and control effects. Usually, managers are supposed to provide strategic inputs.

Synergy effects: They represent the additional positive value from combining two firms. It causes the whole to be greater than the sum of the parts: $V(A + B) > V(A) + V(B)$.

Valuation according to accounting principles: The primary emphasis is placed on the information provided by accounting statements (compare with Economic approach to valuation)

Value decomposition: The decomposition of the valuation process into the consecutive steps makes the price determination transparent (status quo, control and synergy premium, value of embedded options).

Appendix A: Figures

Figure 1: Inputs to Cash Flow Modeling

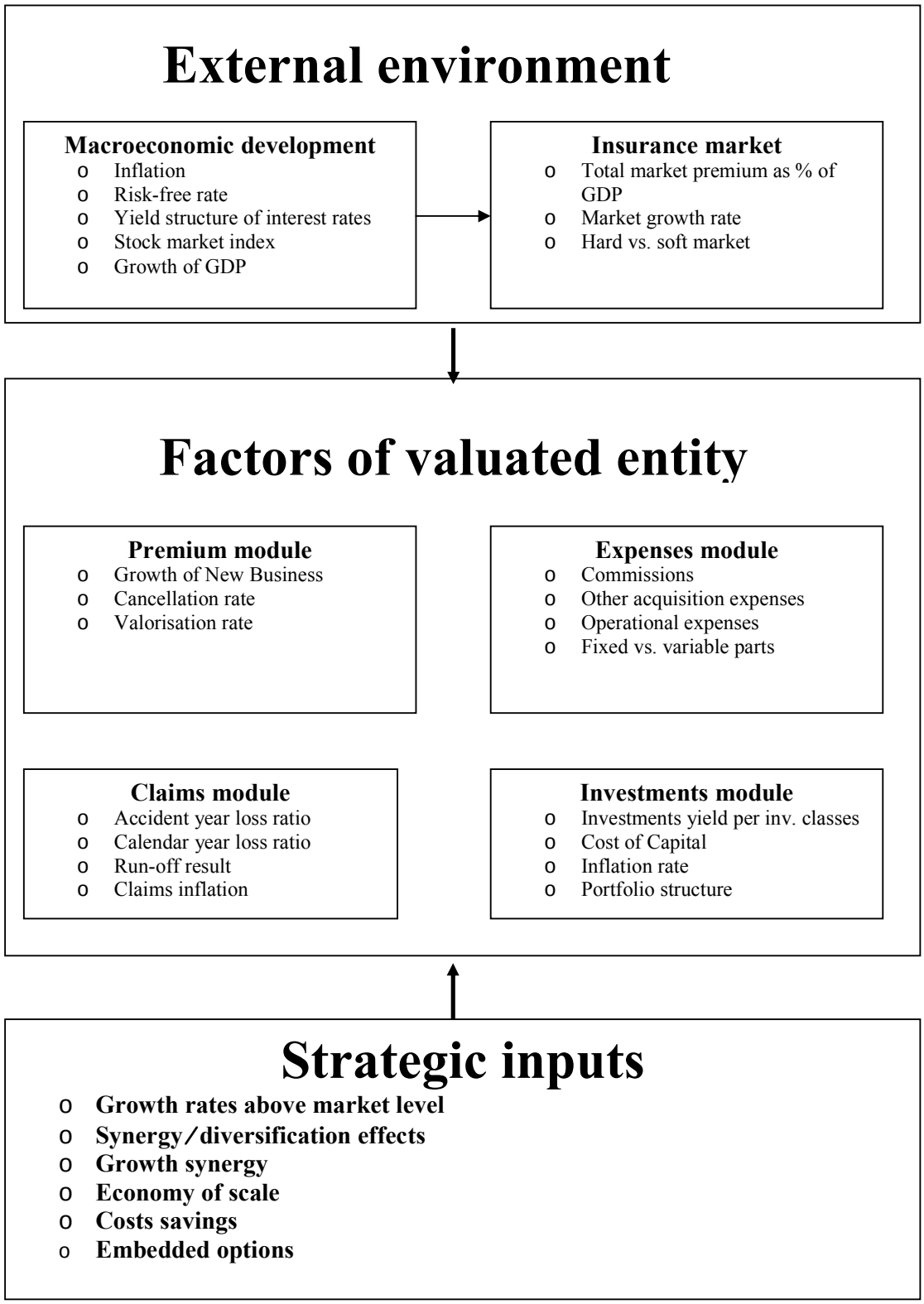


Figure 2: An Example of Interdependencies between Variables

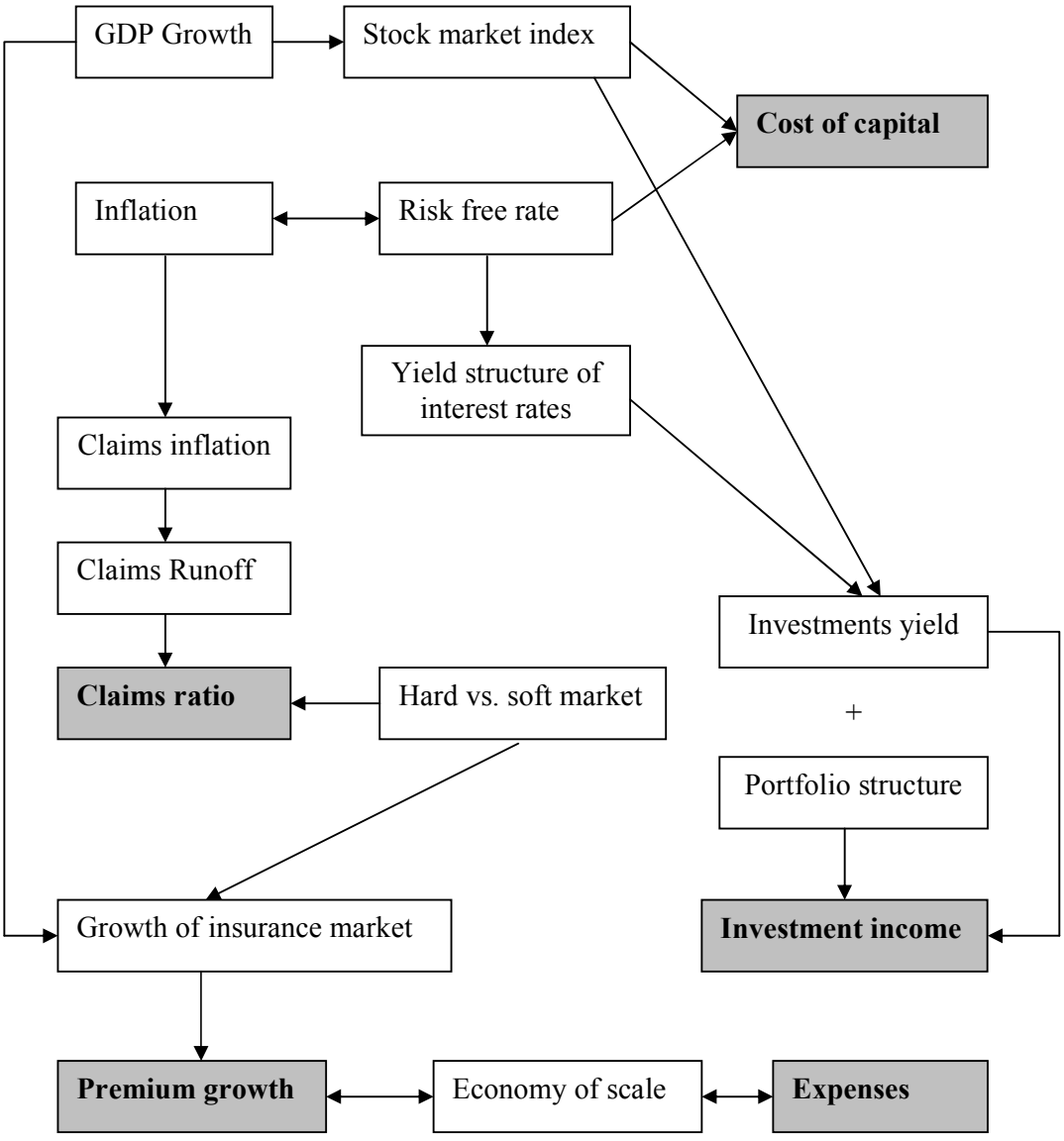
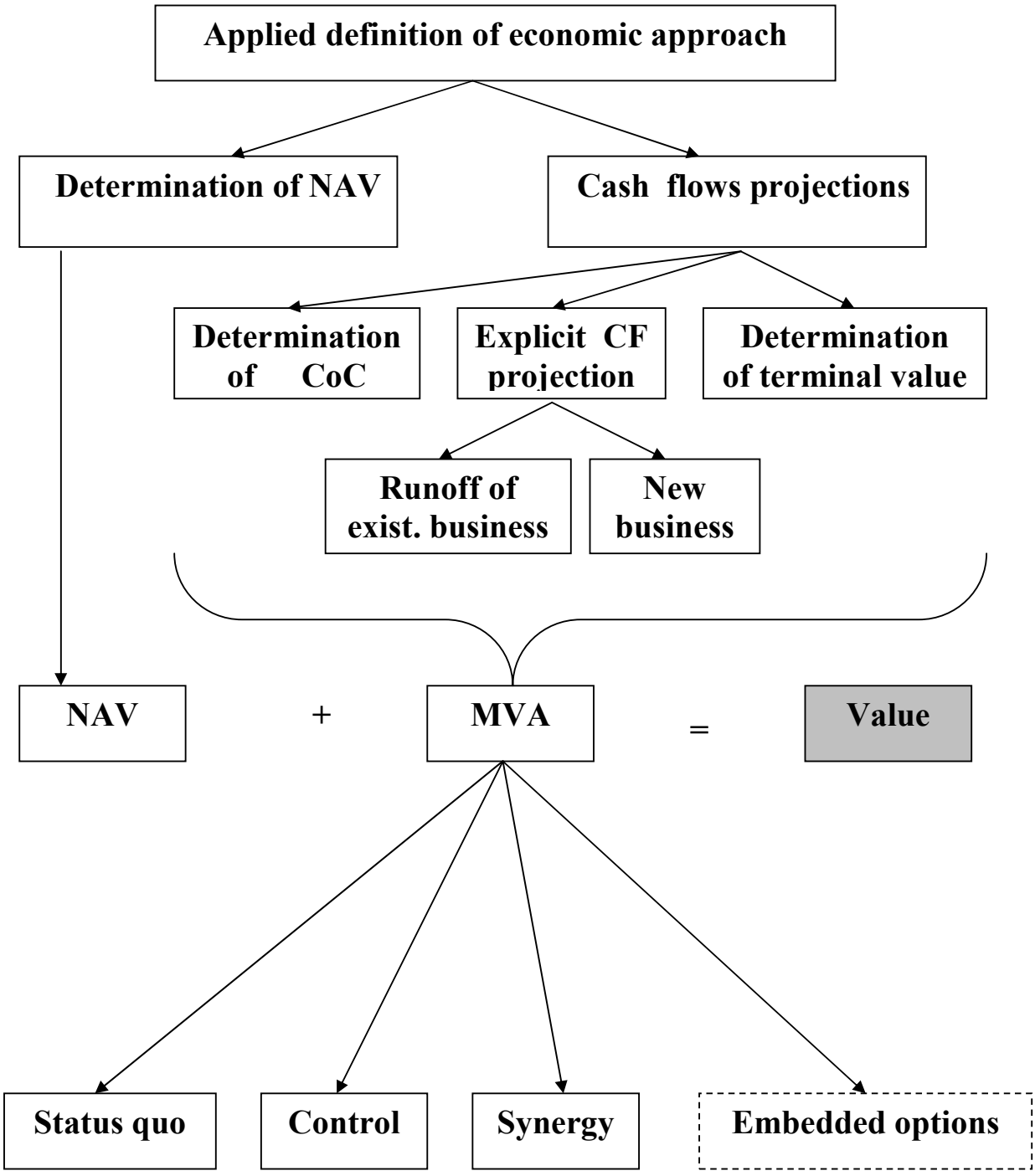


Figure 3: EVA-based Valuation Approach – Value Decomposition



Appendix B:

Value in Dependence on ROE and CoC

Value in dependence on ROE and CoC

- **Infinite horizon**
- **15-year horizon**

Assumption: $NAV_0 = 100$

			ROE												
			8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
CoC	8%	Infinite	100	113	125	138	150	163	175	188	200	213	225	238	250
		15 years	100	109	117	126	134	143	151	160	168	177	186	194	203
	9%	Infinite	89	100	111	122	133	144	156	167	178	189	200	211	222
		15 years	92	100	108	116	124	132	140	148	156	164	173	181	189
	10%	Infinite	80	90	100	110	120	130	140	150	160	170	180	190	200
		15 years	85	92	100	108	115	123	130	138	146	153	161	168	176
	11%	Infinite	73	82	91	100	109	118	127	136	145	155	164	173	182
		15 years	78	86	93	100	107	114	122	129	136	143	150	158	165
	12%	Infinite	67	75	83	92	100	108	117	125	133	142	150	158	167
		15 years	73	80	86	93	100	107	114	120	127	134	141	148	154
	13%	Infinite	62	69	77	85	92	100	108	115	123	131	138	146	154
		15 years	68	74	81	87	94	100	106	113	119	126	132	139	145
	14%	Infinite	57	64	71	79	86	93	100	107	114	121	129	136	143
		15 years	63	69	75	82	88	94	100	106	112	118	125	131	137
	15%	Infinite	53	60	67	73	80	87	93	100	107	113	120	127	133
		15 years	59	65	71	77	82	88	94	100	106	112	118	123	129

Appendix C:
Case study: Acquisition of P/C Insurer from the CEE Region

In the appendix, we extend the paper by a discussion of the acquisition valuation process of a P/C Insurer from the CEE region. It is demonstrated on an illustrative case study. The organization is as follows. In the first section, we identify several specifics to be emphasized by analysts, which the authors find as the most relevant. We draw the appropriate consequences for the given valuation task. Next, we follow the procedure from the chapter 5.2 and illustrate the presented valuation approach on a case study of the acquisition valuation of P/C Insurer from the CEE region.

1. Specifics of the Valuation Process

Although the basic valuation principles are the same whatever insurance company is concerned, there are certainly some particular aspects to be taken into consideration when speaking about emerging markets. Here, we go out from the thesis that a precise identification and analysis of all such specifics is of a crucial importance (prerequisite) for the correct application of the valuation procedure as introduced throughout the paper. Generally, we find the following specifics to be taken into account in respect to the valuation procedure in emerging markets, as represented by the CEE region.

1) Economic environment
First, the changing economic environment is of a key importance. The emerging markets are very often characterized by higher inflation, higher currency fluctuations, instability of balance of payments, budget deficits etc. Any instability must be reflected in the mainly country risk premium as a part of Cost of Capital[21].

2) Legal environment
The legal environment is also developing very quickly in these countries. It concerns of both commercial (e.g. commercial code) and insurance law (e.g. state regulation, new definitions of insurance contract). It is just the stability of the legal and institutional framework (e.g. the level of enforceability of the law) that substantially affects the inflow of foreign investments into emerging markets. Thus, the legal and institutional environment plays an important role in the acquisition strategies.

3) Political risk
This aspect is closely connected to the previous one. It is obvious that the amount of political uncertainty also affects the setting of an appropriate discount rate (CoC).

Remark: With regard to the CEE region we must point out the continuing approaching of the local economies to the EU level (expected access in 2004) in all above-mentioned aspects (economical, legal and political stability).

4) Capital markets
The standard allocation and pricing functions of capital markets is still being established. Capital markets are characterized by several inefficiencies: information asymmetry, lower market liquidity, higher transaction costs, and so on. In addition, the role of stock markets is

[21] As a special case, we can mention the valuation process in the highly inflationary economy.

substantially underdeveloped. All these factors affect both the investment importunities for insurance companies and the valuation of an investments portfolio.

5) Underdeveloped insurance markets

The insurance markets are underdeveloped in the most emerging economies, offering good perspectives for high growth in the future (e.g. aggressive acquisition policy). This aspect represents very often the leading acquisition motive. The product mix is usually characterized by less amount of liability coverage as compared with property lines (predominantly car hull). We must also consider the level of market competitiveness. There can be several market imperfections, whereby information asymmetry plays a substantial role. The market concentration can be also quite large with a few "big market players".

6) Regulation of insurance markets

The state regulation is characterized by ongoing standardization (proficiency of the regulatory staff, regulation standards etc.).

7) Efficiency of P/C Insurance companies

Generally, the operational part of P/C Insurers is distinguished by less efficiency. That is the reason, why the acquisition is usually connected with several necessary restructuring steps (costs cuttings, reduction of staff etc.). Consequently, the combined ratio consists of higher portion of expense ratio at the expense of claims ratio than it is usual in the developed markets. Therefore, it can be a crucial issue for the cash flow projection to correctly estimate the speed of the standardization process (decreasing expense ratio + increasing claims ratio).

8) Accounting standards

Usually, the credibility of information provided by accounting is supposed to be lower than in the developed economies. The analysts can very often meet with very creative bookkeeping what makes their task more difficult.

9) Quality of data for cash flow modeling

The analysts can also face with problems concerning the access to correct and reliable data for the cash flow projection. The historical time series, if available, are very often spoiled due to all the changes in the external environment. Therefore, the information sources must focus rather on an ex-ante (expectation-based) approach than on the analysis of historical data.

In summary, the acquisition valuation process in emerging markets can be characterized by higher uncertainty in all significant variables (external environment, insurance market, company's specifics). On the other hand, there are large growth perspectives and other strategic opportunities.

The overview of all relevant factors including the corresponding consequences for valuation procedure is recapitulated on the following table (Figure 9). Some of them will be directly considered in the presented case study.

	Factor	**Consequence for valuation**
1.	**External environment**	
1.1.	Higher fluctuation of key macroeconomic variables	CoC determination; eventually reflection of inflationary environment

1.2.	Institutional and legal framework	CoC determination
1.3.	Continuing approaching to the EU	Increasing economical and legal stability ⇒ standardization of respective inputs
2.	**Insurance market**	
2.1.	Underdeveloped ins. market	Higher growth rates to be expected
2.2.	State regulation (increasing requirements)	Uncertainty concerning strengthening (changing) rules
2.3.	Competitiveness (higher concentration)	Reflection of the market power
3.	**Insurance companies**	
3.1.	Lower operational efficiency	E.g. cost cuttings
3.2.	"Ratios standardization"	Higher costs ratio vs. relatively low claims ratio; to correctly reflect convergence to more standard levels
3.3.	Product mix (dominance of property products)	Taking into account large risk exposures against one product (e.g. car hull)
3.4.	Creditworthiness of accounting	NAV determination
	- hidden liabilities	Analysis of reserves adequacy
	- "artificial" business volume	Profitability analysis of volume-driven business
	- creative bookkeeping	Cleaning of balance sheet
3.5.	Reliability and quality of internal data	CF modeling must be based rather than on historical experience on the analysts' expectations

Figure 9: Overview of relevant specifics

2. Case study

Now, we explore the case study of an acquisition of a P/C Insurer from the CEE region[1]. In the first part, we begin with the strategic part where we define the outgoing strategic assumptions. They create a general framework for the consecutive valuation modeling (actuarial / financial part).
The key emphasis is placed on the proper application of key assumptions, the correct reflection all the specifics and the appropriate interpretation of results. We concentrate only on several selected issues (economic adjustments by NAV determination, base case scenario, sensitivity analysis etc.), whereby some aspects will be omitted or assumed as given. By no means, it represents a comprehensive valuation study.

2.1. Strategic Part

Let us assume that a foreign insurance company is interested in entry into an insurance market from the CEE region through the acquisition of already established company. The management of the acquiring company specifies the following set of strategic inputs, which corresponds to the long-term expectations. The inputs provided by management can be divided into the following areas.

1. Economic environment

[1] We do not specify any particular country. However, there can be identified several links to Prague.

Because of the general convergence towards the EU economic environment, we expect a stable economic environment in the long term (GDP growth above the EU level, price stability, etc.).

2. Insurance market

The growth opportunities of the insurance market are the leading motives behind the acquisition. According to the management, we can go out from the assumption that the insurance penetration (market premium as % of GDP) should reach the current level of the EU of 3% in the long term.

3. Company specific inputs

Growth: The strategic target is to increase the current market share of 8,5% (e.o. 2001) to 15% in 15 years. More concretely, we expect the high-growth period during the first 5 years. After that, we suppose the decreasing positive gap between the company and market growth rates. It leads to the market share stabilization in the long run.

Product mix: Slightly increasing share of liability products is assumed.

Operational costs: The substantial improvements in the operational part of the business are expected in the middle term (costs savings, higher operational efficiency).

Economy of scale: Both the growth above the market level and the increasing operational efficiency will have positive impacts on the economy of scale. Whereby, the strategic target is to push down the current expense ratio of 33% to the desired level of 25% in the long term.

Claims development: The hardening market competition leads to the increasing claims ratio in the long run up to 75-77%.

In addition, management addresses the following issues:

1) What are the lower and upper boundaries for the acquisition value (serving as a base for the negotiations)?
2) What are the key value drivers?
3) What are the main uncertainties and risks inherent in the acquisition?
4) What happens if the strategic assumptions about market and company growth will not be accomplished?
5) How would look like the worst-case scenario?

2.2. Valuation Modeling (Actuarial / Financial Part)

Based on the set of strategic assumptions, the actuaries and financial analysts must construct the appropriate valuation model. That will be based on the EVA-based valuation approach in the scope as discussed in the paper. We assume the following technical restrictions:

1) Task: to determine the value as of the end of 2001
2) Deterministic modeling
3) We model the product mix as one portfolio (product)
4) We do not consider any reinsurance (gross = net)
5) Explicitly projected period of 15 years (2002 – 2016)

6) Currency: in Mio of local currency
7) We concentrate exclusively on the economic approach to valuation (for simplicity no reserves discounting)

We deal with the following valuation steps in order to provide management with the sufficient support for the negotiations:

1) Construction of the base case scenario
2) Determination of NAV
3) Cash flow projection
4) Identification of key value drivers (sensitivity analysis)
5) Applications of other valuation methods (relative valuation)
6) Construction of the worst-case scenario
7) Summary

2.2.1. Base Case Scenario

Under the base case scenario we understand the combination of the most probable valuation inputs concerning expectations about the future development. It serves as an outgoing base for sensitivity testing. Following equation (5.9), we begin with the determination of NAV. After that, we discuss cash flow projection.

2.2.1.1. Determination of NAV

Let us assume the opening balance sheet according to CAS as of the end of 2001, as illustrated on Figure 10. Our task is to make the appropriate adjustments[22] to get the amount of NAV according to the economic approach.

	Balance sheet	2001		
		CAS	Adjustments	Economic approach
	Assets			
1	**Intangible (ex Goodwill)**	**50**	**0**	**50**
2	**Goodwill**	**150**	**-150**	**0**
3	**Investments**	**6 213**	**93**	**6 306**
3.1	Real estate	246	-57	189
3.2	Investment in aff. Enterprises	0	0	0
3.3	Investments held to maturity	3 494	100	3 594
3.4	Investments available for sales	1 842	50	1 892
3.5	Investments tradable	631	0	631
3.6	Others	0	0	0
4	**Receivables**	**692**	**-250**	**442**
4.1	on direct insurance	650	-250	400
4.2	on reinsurance business	2	0	2
4.3	Others	40	0	40

[22] The here presented overview can be understood as a representative sample of adjustments the analysts can face with when valuing a P/C Insurance company from the CEE region. In no case, it covers a comprehensive listing.

5	**DAC**	**398**	**-100**	**298**
6	**Other assets**	**146**	**-50**	**96**
7	**Deferred tax assets**	0	204	204
	Total	**7 648**	**-253**	**7 395**

	Liabilities			
1	**Net asset value (Equity)**	**1 877**	**-453**	**1 424**
1.1	Paid in Capital	1 000	0	1 000
1.2	Retained earnings	730	-453	277
1.3	Unappropriated profit/accumulated losses	0	0	0
1.4	Profit / loss of the current year	147	0	147
2+3+4	**Liabilities**	**5 771**	**200**	**5 971**
2	**Technical provisions**	**5 103**	**200**	**5 303**
2.1	Unearned premiums reserves	2 189	100	2 289
2.2	Claim reserves	2 714	300	3 014
2.3	Equalisation reserve	200	-200	0
2.4	Bonus Reserve	0	0	0
2.5	Other underwriting fund and provisions	0	0	0
3	**Other provisions/liability**	**668**	**0**	**668**
4	**Deferred tax liabilities**	**0**	**0**	**0**
	Total	**7 648**	**-253**	**7 395**

Figure 10: Determination of NAV - from statutory accounting to economic approach

Explanation to adjustments

Assets:

Row 2: Elimination of goodwill (goodwill will be considered as a part of MVA within cash flow projection).

Row 3.1: Real estate was overestimated according to statutory accounting (best estimate).

Row 3.3: Since fixed income was carried at purchase values net of unrealized losses, we proceed the revaluation following market prices (hidden reserves).

Row 3.4: Since fixed income was carried at purchase values net of unrealized losses, we proceed the revaluation following market prices (hidden reserves).

Row 4.1: The company holds a large amount of outstanding receivables from direct insurance. Whereby the analysts are convinced (based on the credit risk analysis) that the created accounting adjustments to receivables are substantially underestimated. This adjustment decreases net amount of receivables.

Row 5: The company capitalized some items of marketing expenses in the past. Since no substantial impact on future business has been proved, we exclude these items from DAC and charge them directly against NAV.

Row 6: This adjustment corresponds to the balance sheet cleaning (deferrals etc.).

Liabilities:

Row 2.1: Reflection of premium deficiencies. There are still many unprofitable policies in the company portfolio as a result of the former strategy pushing the business volume at the expense of profitability.

Row 2.2: Best estimate of claims reserves (for the sake of simplicity no reserves discounting). The analysis of claims reserves adequacy has revealed some deficiencies.

Row 2.3: Elimination of equalization reserve (according to economic approach does not represent a particular liability).

Tax effects:
Row 7: Tax impacts from all above listed adjustments (statutory tax rate of 31% is applied).

NAV change:
Row 1.4: If we sum all the adjustments including the tax impacts, then we get the amount of change in NAV.

Conclusion:
Following the economic approach, we determined the amount of **NAV at 1 424 Mio** as of the end of 2001. What is important, this amount is sufficiently above statutory solvency requirements (above 30% of written premium as compared with statutory requirement of approx. 22%) and in line with risk capital concept (additional assumption). Therefore, no capital injection is necessary. Although we were very conservative concerning some items (e.g. deferrals, cleaning of balance sheet, premium deficiencies), there is still some amount of uncertainty left:

- The appropriateness of adjustments to receivables (no data for a reliable analysis available)
- Claims reserves adequacy (too short time series in order to proceed a more reliable analysis of claims reserves adequacy)

If we considered these uncertainties, than the worst case scenario would drop the estimated NAV by additional cca. 300 mio.

2.2.1.2. Cash Flow Modeling

Based on the set of strategic assumptions, we can summarize the following inputs to cash flow modeling, which determine the base case scenario.

A. Macroeconomic factors
Since the given economy has reached the stability in all relevant economic variables recently (inflation rate, interest rates and so on), we do not expect any dramatic movements in this respect. That is the reason, why we suppose key macroeconomic variables to be stable in the long term, as follows:
Real growth of GDP 3,50%,
Inflation rate 3,00%,
Risk free rate 4,00%.

B. Industry-specific factors
The projected growth of the insurance penetration (market premium as a % of GDP) is supposed to reach the current level of the EU of 3% in the long term (in 15 years). Whereby the spread over time is assumed to be linear. In addition, we expect the continuing trends towards the higher industry efficiency (decreasing expense ratios, increasing claims ratios).

C. Company-specific inputs
Analyzing all the company-specific factors, we determine the following trends in key variables.

C.1. Premium module

Key inputs	2002	2003	2004	2005	2006
Growth rate of Nr of New business	12,0%	20,0%	16,0%	12,8%	10,2%

Commentary: Starting with 2003, we expect a substantial increase of Nr of New business with a declining tendency. From 2007, we suppose stable growth of 7,5%.

Key outputs					
Growth rate of premium	9,5%	11,5%	13,2%	13,8%	13,4%
Market share	8,8%	9,0%	9,4%	9,9%	10,4%

Commentary: From 2007, we expect the decreasing growth rate (=decreasing gap between market and company growth rate). The market share is developing accordingly.

C.2. Expenses module

Key inputs	2002	2003	2004	2005	2006
Commission rate as % of premium	13,0%	12,7%	12,4%	12,0%	11,7%
Other acquisition expenses as % of premium	7,0%	6,8%	6,7%	6,5%	6,3%
Improvements in operational efficiency (costs savings in Mio)	-14	-32	-32	-9	-5

Operational expenses - variable part (in 2001: 252 mio) grow in line with premium

Operational expenses - fixed part (in 2001: 342 mio) grow in line with inflation rate + 1,5%

Commentary: Higher transparency in commission schemes should push down the overall acquisition costs ratio to 18% in the long run. Furthermore, we suppose substantial costs savings in overheads (as compared with the outgoing base of 2001) due to improved operational efficiency during the first 5 years.

Key output					
Expense ratio	33,3%	32,0%	30,6%	29,6%	28,6%

Commentary: The projected expense ratio is expected to dramatically decrease at the beginning of the projected period because of both costs savings and the effects of economy of scale. The development aims at reaching the strategic target of 25% in the long term.

C.3. Claims module

	2002	2003	2004	2005	2006
Accident year claims ratio	70,0%	70,0%	70,0%	70,0%	70,0%

Commentary: Since the insurance market is not still efficient enough, we find projected claims ratio of 70% by 2006 as conservative estimation. From 2007, we expect gradual increase up to 77% in the long term. Furthermore, we assume the shifts in payoff pattern (longer time delay) because of increasing portion of liability coverage.

C.4. Investments module

Key inputs	2002	2003	2004	2005	2006
Risk free rate	4,7%	4,8%	4,5%	4,0%	4,0%
Beta	100,0%	100,0%	100,0%	100,0%	100,0%

Market risk premium	5,5%	5,5%	5,5%	5,5%	5,5%
CoC	**10,2%**	**10,3%**	**10,0%**	**9,5%**	**9,5%**
Investment yield	6,8%	6,9%	6,6%	6,1%	6,1%

Commentary: Concerning the determination of CoC, its first component - risk free rate is determined by YTM on government bond with 10y maturity. The risk free rate includes country risk. Since there is no reliable market information (from stock market) for determination of risk premium, we must rely on the analysts' assumptions (derived from standard markets). The total investment yield is determined as the weighted average of portfolio structure and the corresponding yields on different asset classes (derived from risk free rate + appropriate risk and term premiums). From 2007, we keep the same assumptions as in 2006.

Figure 11: Overview of company-specific inputs

2.2.1.3. Valuation Outputs

Incorporating all these inputs into the valuation model, we get the P&L statement over the projected period (see Figure 12). You can see the profitability development at the bottom of the table, as measured by the gap between ROE and CoC. At the first glance, the development seems to be reasonable. The increasing profitability over the first 5 years corresponds to both successful restructuring steps (cost cuttings etc.) and effects of economy of scale. The rest of explicitly projected period is affected be the tightening insurance market (increasing claims ratio), pushing down ROE slightly above the rate of CoC in the long term. That is in line with the management's assumption that the company cannot beat the market continuously in the long run (efficient market hypothesis). Following this thesis, the determination of terminal value in the base case scenario go out from the assumption ROE = CoC, what implies terminal value to be zero.

P&L Statement	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Premiums written	5 011	5 588	6 328	7 199	8 165	9 233	10 415	11 724	13 177	14 789	16 581	18 573	20 789	23 255	26 000
Change in unearned premium reserves	-217	-289	-370	-435	-483	-534	-591	-655	-726	-806	-896	-996	-1 108	-1 233	-1 373
Premiums earned	4 794	5 299	5 958	6 764	7 682	8 699	9 824	11 069	12 450	13 983	15 685	17 577	19 681	22 022	24 628
Claims paid accident year	-1 991	-2 176	-2 419	-2 715	-3 047	-3 444	-3 881	-4 363	-4 894	-5 481	-6 130	-6 846	-7 638	-8 513	-9 482
Claims reserves accident year	-1 365	-1 533	-1 752	-2 020	-2 330	-2 706	-3 133	-3 618	-4 169	-4 796	-5 509	-6 319	-7 241	-8 289	-9 482
Claims paid previous years	-1 082	-1 175	-1 284	-1 421	-1 591	-1 794	-2 036	-2 318	-2 643	-3 027	-3 463	-3 959	-4 521	-5 159	-5 881
Change in claim reserves previous years	1 082	1 175	1 284	1 421	1 591	1 794	2 036	2 318	2 643	3 027	3 463	3 959	4 521	5 159	5 881
Claims Run-off	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commissions	-651	-708	-782	-866	-955	-1 077	-1 212	-1 360	-1 525	-1 706	-1 908	-2 131	-2 378	-2 653	-2 958
Change in DAC	28	28	37	42	45	61	67	74	82	91	101	112	124	137	152
Commissions incl. DAC	-623	-680	-745	-824	-911	-1 016	-1 145	-1 286	-1 442	-1 615	-1 807	-2 019	-2 255	-2 516	-2 805
Other acquisition expenses	-351	-381	-421	-466	-514	-580	-652	-732	-821	-919	-1 027	-1 147	-1 281	-1 428	-1 593
Operational expenses	-620	-635	-659	-711	-772	-844	-922	-1 008	-1 103	-1 207	-1 321	-1 447	-1 586	-1 739	-1 908
Total expenses	-1 594	-1 696	-1 824	-2 001	-2 197	-2 440	-2 719	-3 027	-3 366	-3 741	-4 155	-4 613	-5 121	-5 683	-6 306
Underwriting result	-156	-107	-37	28	108	109	90	62	20	-35	-108	-201	-319	-464	-642
Other technical result	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Investment income	378	423	454	477	546	627	723	834	963	1 110	1 279	1 471	1 691	1 941	2 226
Insurance result	222	317	417	505	653	736	813	896	983	1 075	1 171	1 270	1 372	1 477	1 586
Other income / expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total profit before tax	222	317	417	505	653	736	813	896	983	1 075	1 171	1 270	1 372	1 477	1 586
Taxes	-69	-98	-129	-157	-203	-228	-252	-278	-305	-333	-363	-394	-425	-458	-492
Total profit after tax	153	218	288	348	451	508	561	618	678	742	808	876	947	1 019	1 094
EVA	2	47	96	136	200	212	214	215	214	210	202	190	174	154	128
Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discounted EVA	2	38	72	94	127	123	113	104	94	85	74	64	54	43	33
Sum of discounted EVA (MVA)	2	40	112	206	333	456	569	674	768	853	927	991	1 045	1 088	1 121
Profitability															
NAV b.o.p.	1 406	1 560	1 778	2 066	2 414	2 865	3 373	3 934	4 552	5 231	5 973	6 780	7 657	8 603	9 623
NAV e.o.p.	1 560	1 778	2 066	2 414	2 865	3 373	3 934	4 552	5 231	5 973	6 780	7 657	8 603	9 623	10 717
ROE	10,3%	13,1%	15,0%	15,6%	17,1%	16,3%	15,4%	14,6%	13,9%	13,2%	12,7%	12,1%	11,6%	11,2%	10,8%
CoC	10,2%	10,3%	10,0%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%
Gap ROE vs. COC	0,1%	2,8%	5,0%	6,1%	7,6%	6,8%	5,9%	5,1%	4,4%	3,7%	3,2%	2,6%	2,1%	1,7%	1,3%

Value = NAV + MVA	2 527
Net Asset Value (NAV)	1 406
Market Value Added (MVA)	1 121
- explicit cash flows modelling (2002-2016)	1 121
- terminal value	0
- - ROE	9,5%
- - CoC	9,5%

Figure 12: Cash flow projection – P&L

A good insight into the value adequacy can provide the value decomposition into its two main components: NAV and MVA (see Figure 13).

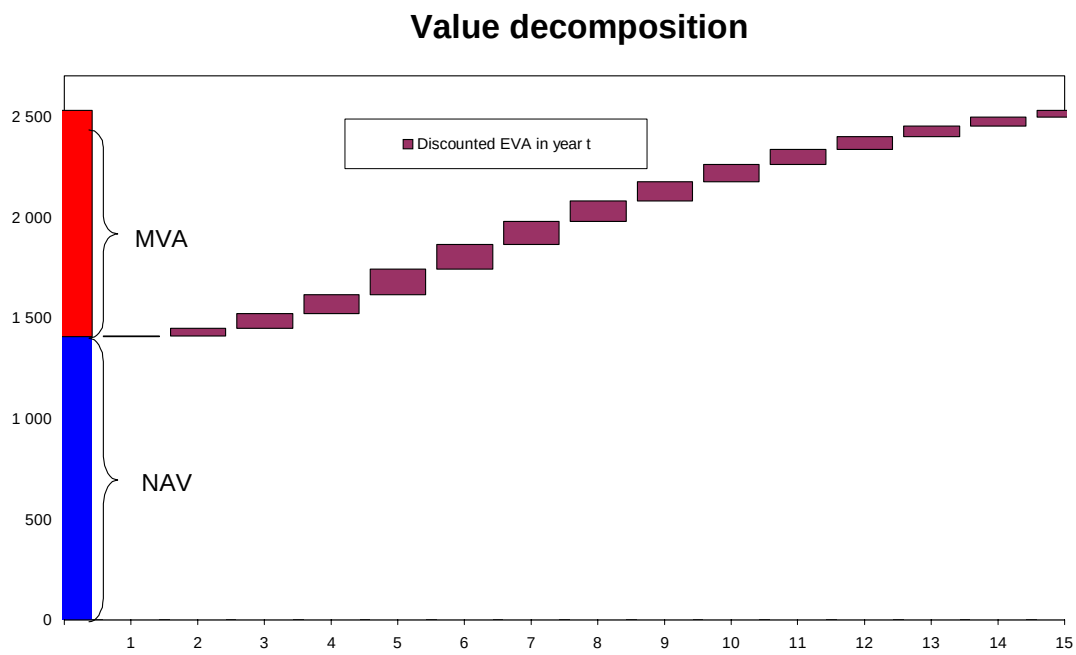


Figure 13: Value decomposition

The share of MVA on the total value accounts for less than 50%. That is based on the assumption that terminal value equals zero (ROE = CoC). What happens if we relax this assumption illustrates Figure 14 (sensitivity of terminal value on the gap between ROE and CoC).

Value = NAV + MVA	**2 527**	**2 672**	**2 816**	**2 961**	**3 105**	**3 250**
% change in Value	0,0%	5,7%	11,4%	17,2%	22,9%	28,6%
Net Asset Value (NAV)	1 406	1 406	1 406	1 406	1 406	1 406
Market Value Added (MVA)	1 121	1 265	1 410	1 554	1 699	1 844
% change in MVA	0,0%	12,9%	25,8%	38,7%	51,6%	64,5%
- explicit cash flows modelling (2002-2016)	1 121	1 121	1 121	1 121	1 121	1 121
- terminal value	0	145	289	434	578	723
- - ROE	9,5%	10,0%	10,5%	11,0%	11,5%	12,0%
- - CoC	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%
- - gap ROE vs. CoC	0,0%	0,5%	1,0%	1,5%	2,0%	2,5%

Figure 14: Terminal value determination

The ROE exceeding CoC by 1% leads to an increase of MVA by more than 25% (2% would lead to an increase of above 50%). Therefore, the procedure how the terminal value is determined critically influences the estimated value.

To complete our analysis of base case scenario, it is also useful to deal with key variables and ratios, as presented on Figure 15.

Overview of key variables and ratios

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
A) Premium															
Growth rate of premium	9,5%	11,5%	13,2%	13,8%	13,4%	13,1%	12,8%	12,6%	12,4%	12,2%	12,1%	12,0%	11,9%	11,9%	11,8%
Growth rate of Nr of New business	12,0%	20,0%	16,0%	12,8%	10,2%	7,5%	7,5%	7,5%	7,5%	7,5%	7,5%	7,5%	7,5%	7,5%	7,5%
Growth rate of Avg premium of New business	5,0%	4,6%	4,8%	4,4%	3,8%	3,8%	3,8%	3,8%	3,8%	3,8%	3,8%	3,8%	3,8%	3,8%	3,8%
Cancellation rate (portfolio outflow)	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%	10,0%
Valorisation rate of portfolio as of beginning of period	4,0%	3,7%	3,8%	3,5%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%
Market share	8,8%	9,0%	9,4%	9,9%	10,4%	10,9%	11,3%	11,8%	12,3%	12,8%	13,3%	13,7%	14,2%	14,7%	15,3%
Market growth rate	9,1%	9,2%	9,1%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%	8,0%
Diff. ratio: Growth above market level	0,4%	2,3%	4,2%	5,7%	5,4%	5,1%	4,8%	4,5%	4,4%	4,2%	4,1%	4,0%	3,9%	3,8%	3,8%
B) Expenses															
Total expense ratio (incl. DAC) as % of e	33,3%	32,0%	30,6%	29,6%	28,6%	28,1%	27,7%	27,3%	27,0%	26,8%	26,5%	26,2%	26,0%	25,8%	25,6%
Commission rate as % of premium	13,0%	12,8%	12,5%	12,2%	11,9%	11,7%	11,7%	11,6%	11,6%	11,6%	11,5%	11,5%	11,5%	11,4%	11,4%
Other acquisition expenses as % of premium	7,3%	7,2%	7,1%	6,9%	6,7%	6,7%	6,6%	6,6%	6,6%	6,6%	6,5%	6,5%	6,5%	6,5%	6,5%
Variable part of operational expenses	44,4%	48,4%	52,8%	55,7%	58,2%	60,2%	62,1%	64,0%	65,7%	67,4%	69,0%	70,6%	72,1%	73,6%	74,9%
Operational expenses as % of premium	12,9%	12,0%	11,1%	10,5%	10,1%	9,7%	9,4%	9,1%	8,9%	8,6%	8,4%	8,2%	8,1%	7,9%	7,7%
Growth rate of total expenses	8,3%	6,4%	7,5%	9,7%	9,8%	11,1%	11,4%	11,3%	11,2%	11,1%	11,1%	11,0%	11,0%	11,0%	11,0%
Diff. ratio: growth rate of premium - growth rate of total expenses	1,1%	5,1%	5,7%	4,1%	3,6%	2,0%	1,4%	1,3%	1,2%	1,1%	1,0%	1,0%	0,9%	0,9%	0,8%
C) Claims															
Accident year claims ratio	70,0%	70,0%	70,0%	70,0%	70,0%	70,7%	71,4%	72,1%	72,8%	73,5%	74,2%	74,9%	75,6%	76,3%	77,0%
Calender year claims ratio	70,0%	70,0%	70,0%	70,0%	70,0%	70,7%	71,4%	72,1%	72,8%	73,5%	74,2%	74,9%	75,6%	76,3%	77,0%
Combined ratio	103,3%	102,0%	100,6%	99,6%	98,6%	98,8%	99,1%	99,4%	99,8%	100,3%	100,7%	101,1%	101,6%	102,1%	102,6%
D) Investments															
Risk free rate	4,7%	4,8%	4,5%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%
Inflation rate	3,7%	3,8%	3,5%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%
Investments yield	6,8%	6,9%	6,6%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%	6,1%
Investments result in % of earned premi	7,9%	8,0%	7,6%	7,0%	7,1%	7,2%	7,4%	7,5%	7,7%	7,9%	8,2%	8,4%	8,6%	8,8%	9,0%
Asset leverage	138,0%	138,7%	139,7%	141,4%	144,6%	148,4%	152,5%	156,8%	161,1%	165,4%	169,5%	173,5%	177,4%	181,1%	184,8%
CoC	10,2%	10,3%	10,0%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%
E) Overall result															
ROE	10,3%	13,1%	15,0%	15,6%	17,1%	16,3%	15,4%	14,6%	13,9%	13,2%	12,7%	12,1%	11,6%	11,2%	10,8%
Diff. ratio: ROE vs. COC	0,1%	2,8%	5,0%	6,1%	7,6%	6,8%	5,9%	5,1%	4,4%	3,7%	3,2%	2,6%	2,1%	1,7%	1,3%

Figure 15: Overview of key variables and ratios

The ratios are divided into the same subcategories as valuation inputs. For instance, we can test the adequacy of premium growth as a difference between market and company growth rates. The peak is reached in 2005 and after that we follow the steady decline leading to a stabilization of market share in the long run. Concerning the ratios related to expenses, we emphasize, besides expense ratio (the strategic target of 25%), the difference ratio between growth rate of premium and growth rate of total expenses. It can be easily interpreted as the contribution of economy of scale. Combined ratio is over the whole projected period around 100%. Its development is determined by steadily decreasing expense ratio and by increasing (from 2007) claims ratio up to 77% in the long run. The changing product mix is partly considered in the increasing asset leverage (because of increasing reserves ratio). It leads to an increasing importance of investment result as measured as % of earned premium. The profitability development has been already discussed above.

2.2.1.4. Sensitivity Analysis

To identify key value drivers, it is worth preceding sensitivity analysis with respect to most important underlying valuation assumptions.

1. Premium growth rate (economy of scale)

The expected growth was deduced from both the expected growth of the whole insurance market (top-down approach) and the company growth above market level. The magnitude of growth has a substantial effect on the achieved economy of scale (through the connection to the fixed part of operational expenses).

Change in Premium growth rate				
Change	Value	Change in %	MVA	Change in %
0,0%	**2 527**	**0,0%**	**1 121**	**0,0%**
1,0%	**2 756**	**9,0%**	**1 349**	**20,4%**
2,0%	**2 995**	**18,5%**	**1 588**	**41,7%**
3,0%	**3 245**	**28,4%**	**1 839**	**64,1%**
4,0%	**3 507**	**38,8%**	**2 101**	**87,4%**
5,0%	**3 781**	**49,6%**	**2 375**	**111,9%**
-1,0%	**2 309**	**-8,6%**	**902**	**-19,5%**
-2,0%	**2 100**	**-16,9%**	**694**	**-38,1%**
-3,0%	**1 901**	**-24,8%**	**494**	**-55,9%**
-4,0%	**1 710**	**-32,3%**	**304**	**-72,9%**
-5,0%	**1 529**	**-39,5%**	**122**	**-89,1%**

The interpretation of results is straightforward:

- If the annual growth were by 2% higher over the whole projected period, the estimated MVA would be higher by 41,7%.
- Or alternatively, the less realistic assumption of higher annual premium growth by 5%, corresponding to market share above 25% in 2016, would imply the value larger by 50%.
- On the other hand, if we supposed the stable market share (= the annual growth lower by 4%), the MVA would drop by approximately ¾ (compare with the worst case scenario 2.2.2).

The projected premium growth and the level of achieved economy of scale substantially impact the estimated value. However, the performed analysis is based on the assumption other things being equal. It means that we neglect some interdependencies (e.g. higher growth would probable imply more aggressive acquisition and underwriting policy).

Now, we explore two variable components of combined ratio: claims ratio, and commission and other acquisition expenses ratio. As previously, we suppose no effects on other parameters (other things being equal).

2. Claims ratio

Change in Claims ratio				
Change	Value	Change in %	MVA	Change in %
0,0%	**2 527**	**0,0%**	**1 121**	**0,0%**
0,5%	**2 388**	**-5,5%**	**981**	**-12,4%**
1,0%	**2 248**	**-11,0%**	**842**	**-24,9%**
1,5%	**2 109**	**-16,6%**	**702**	**-37,3%**
2,0%	**1 969**	**-22,1%**	**563**	**-49,8%**
-0,5%	**2 666**	**5,5%**	**1 260**	**12,4%**
-1,0%	**2 806**	**11,0%**	**1 400**	**24,9%**
-1,5%	**2 945**	**16,6%**	**1 539**	**37,3%**
-2,0%	**3 085**	**22,1%**	**1 679**	**49,8%**

3. Commission and other acquisition expenses ratio

Change in Commission and other acquisition expenses ratio				
Change	Value	Change in %	MVA	Change in %
0,0%	**2 527**	**0,0%**	**1 121**	**0,0%**
0,5%	**2 376**	**-6,0%**	**969**	**-13,5%**
1,0%	**2 224**	**-12,0%**	**818**	**-27,0%**
1,5%	**2 073**	**-18,0%**	**667**	**-40,5%**
2,0%	**1 922**	**-24,0%**	**515**	**-54,0%**
-0,5%	**2 678**	**6,0%**	**1 272**	**13,5%**
-1,0%	**2 830**	**12,0%**	**1 423**	**27,0%**
-1,5%	**2 981**	**18,0%**	**1 575**	**40,5%**
-2,0%	**3 132**	**24,0%**	**1 726**	**54,0%**

It is clear that the valuation outputs are critically sensitive on the variable components of combined ratio. If we compare the sensitivity of both claims and commission and other acquisition expenses ratio, changes in claims ratio have smaller impacts due to compensation on the investments side (higher claims ratio increases reserves and thus investments income).

4. Costs of capital

The determination of an appropriate discount rate is of the central importance in any DCF (EVA) based valuation approach. Mainly in the developing economies we can face with the problem that there is a large amount of uncertainty concerning the specification of an adequate risk premium. That is the reason, why we explore the sensitivity on CoC (more specifically: risk premium), without taking into account other interdependences (e.g. investment yield etc.).

Change in Cost of Capital				
Change	Value	Change in %	MVA	Change in %
0,0%	**2 527**	**0,0%**	**1 121**	**0,0%**
0,5%	**2 344**	**-7,3%**	**937**	**-16,4%**
1,0%	**2 173**	**-14,0%**	**767**	**-31,6%**
1,5%	**2 015**	**-20,3%**	**609**	**-45,7%**
2,0%	**1 868**	**-26,1%**	**462**	**-58,8%**
-0,5%	**2 724**	**7,8%**	**1 318**	**17,6%**
-1,0%	**2 937**	**16,2%**	**1 531**	**36,6%**
-1,5%	**3 167**	**25,3%**	**1 760**	**57,1%**
-2,0%	**3 414**	**35,1%**	**2 007**	**79,1%**

We supposed that the whole amount of country risk premium is already included in the risk free rate. Next, the risk premium was set in a standard way. What happens, if we assume that risk free rate cannot embrace the total country risk premium, shows the table above. For instance, the 1% increase in risk premium cuts the estimated MVA by one third.

5. Risk free rate

The change in risk free rate affects in our contemplation both CoC and investments yield. The positive effect on investment income is compensated by the opposite effect resulting from costs of holding capital and discounting.

Change in Risk free rate				
Change	Value	Change in %	MVA	Change in %

0,0%	**2 527**	**0,0%**	**1 121**	**0,0%**
0,5%	**2 509**	**-0,7%**	**1 102**	**-1,6%**
1,0%	**2 483**	**-1,7%**	**1 077**	**-3,9%**
1,5%	**2 452**	**-3,0%**	**1 046**	**-6,7%**
2,0%	**2 415**	**-4,4%**	**1 009**	**-10,0%**
-0,5%	**2 537**	**0,4%**	**1 130**	**0,9%**
-1,0%	**2 536**	**0,4%**	**1 130**	**0,8%**
-1,5%	**2 525**	**-0,1%**	**1 118**	**-0,2%**
-2,0%	**2 500**	**-1,1%**	**1 093**	**-2,4%**

You can see that the effect of changed risk free rate is due to mentioned compensation negligible. However, we completely overlook the relationship with inflation rate and claims reserves payoff.

6. Investment yield

Last but not least, we explore the sensitivity on investment yield. We suppose changes in investment yield without any interrelationships and dependencies with other variables (e.g. risk free rate, respectively CoC).

Change in Investment yield				
Change	**Value**	**Change in %**	**MVA**	**Change in %**
0,0%	**2 527**	**0,0%**	**1 121**	**0,0%**
0,5%	**2 703**	**7,0%**	**1 297**	**15,7%**
1,0%	**2 879**	**13,9%**	**1 473**	**31,4%**
1,5%	**3 055**	**20,9%**	**1 649**	**47,1%**
2,0%	**3 231**	**27,9%**	**1 825**	**62,9%**
-0,5%	**2 351**	**-7,0%**	**945**	**-15,7%**
-1,0%	**2 175**	**-13,9%**	**768**	**-31,4%**
-1,5%	**1 999**	**-20,9%**	**592**	**-47,1%**
-2,0%	**1 822**	**-27,9%**	**416**	**-62,9%**

Conclusion:

We find the mainly **growth rates of premium** together with the achieved level of **economy of scale** as the key factors substantially influencing the estimated value. Furthermore, the discount rate (**CoC**) is of a key importance here. The components of profit margin, as represented here by the variable components of combined ratio and the investment yield (no dependencies with CoC assumed), are also very relevant factors. But we dare to believe that under the standard market environment they tend to be more or less determined by the industry environment in the middle term.

2.2.1.5. Application of Relative Valuation (Decomposition of V/P Ratio)

We apply the relative valuation utilizing the analysis of V/P ratio, as discussed in Section 4.4.2, in order to check the reasonability and correctness of the results given by the EVA-based valuation approach. We proceed in the following way. First, we substitute the inputs utilized by the EVA-based valuation approach into the decomposed relative measure (V/P ratio). Next, we compare the resulting decomposed V/P ratio with the EVA-based valuation. We go out from the thesis that if the valuation assumptions are roughly the same, both methods should bring similar results. If it is not the case, there must be some discrepancies in the valuation assumptions.

A) Relative valuation
Following equation (4.7) and incorporating tax rate, we obtain:

V/P = (1 / CoC) * [(1 – combined ratio) + AL*IY)] * (1 - tax rate).

The weighted averages over the 15-year horizon of explicit cash flow modeling are utilized as the respective inputs.

Avg. combined ratio	100,9%
Avg. IY	6,2%
Avg. AL	165,9%
Avg. CoC	9,5%
Avg. tax rate	31,0%
V/P ratio according to relative valuation	**67,4%**

B) EVA-based valuation
In this case, we relate the estimated value to the expected premium in t = 1.

Premium (expected in t = 1)	5 011
Value	2 527
V/P ratio as a result of EVA based valuation	**50,4%**

While the estimated value according to the EVA-based valuation approach corresponds to V/P ratio of 50,4%, utilizing decomposition we get V/P ratio of 67,4%. Where does the difference come from?

Obviously, there is a difference in the considered time horizon. While the decomposition implicitly assumes the infinite horizon (for details see Section 4.4.2), the EVA-based valuation takes into account the only first 15 years of explicit cash flow modeling (terminal value is given at zero). To reach the comparability of both approaches, we must apply the same assumption concerning the infinite horizon. In our case, it means to calculate the terminal value in the EVA-based valuation approach by projecting ROE and CoC into infinite (the average values from cash flow modeling are to be applied).

Avg. Diff. ratio: ROE vs. COC	3,3%
Terminal value	959
Value adjusted by terminal value	3 486
Adjusted V/P ratio as a result of EVA based valuation	**69,6%**

Conclusion:
The V/P ratio according to relative valuation yields 67,4%. The corresponding value from the EVA-based valuation approach extended over the infinite horizon (to insure the consistency) gives the very similar result of 69,6%. The comparability of both results confirms that the valuation assumptions were applied in the correct way and there are no logical inconsistencies.

2.2.2. Worst Case Scenario

Although the assumptions in the base case scenario, in the mainly underwriting part, were conservative and realistic enough, the sensitivity analysis has disclosed high dependence on the premium growth rate and the achieved economy of scale (quite strong assumptions about market and company growth). That is the reason, why management puts the question, what happens if the expected growth perspectives will not be accomplished.

To analyze this issue, we construct the so-called **worst-case scenario**. It represents the combination of several adverse but still reasonable assumptions, but in no case it represents a catastrophic scenario (the emphasis on reasonability is here of a key importance).

2.2.2.1. Determination of NAV

Recalling Section 2.2.1.1, there are two main uncertain areas in the determination of NAV: adjustments to receivables and claims reserves adequacy. In the worst case, they could reduce NAV by 300 mio. Thus, NAV is estimated at 1 106 mio., according to the worst case scenario.

2.2.2.2. Cash Flow Modeling

We believe that the worst-case scenario should be primarily investigated with regard to the strategic assumptions. We will consider the following adverse development:

- **Lower growth of the insurance market**
  Within the projected period the insurance market will grow at lower rates.
- **The company's growth in line with the market**
  Fast no increase of the market share is expected. We assume very moderate growth of No. of New business.
- **Portfolio structure**
  The share of liability products will grow more moderately. It implies the shorter payoff pattern and consequently the lower asset leverage as compared with the base case scenario.
- **Costs savings**
  The space for costs savings through the improved operational efficiency will not be achieved to such a large extent as initially expected.
- **Economy of scale**
  The above aspects imply that the large expectations concerning economy of scale will not be fully realized.
- **Other underwriting and investments assumptions**
  All other underwriting and investments (including CoC) assumption will be for the sake of simplicity kept just the same.

To sum up, the presented worst-case scenario focuses primarily on the adverse development on the production and operational side (economy of scale). The other underwriting and investments parameters follow the assumptions from the base scenario. Explanation:

- Just the production and operational expenses (economy of scale) parameters represent key strategic inputs, which determine the main objective behind the given acquisition strategy and therefore should be critically tested under the adverse development.
- On the other hand, underwriting and investments parameters are to a large extent determined externally (by insurance markets - hard vs. soft market, competition, and

by financial markets) and are therefore only partly influenceable by management. Thus, they are of a less importance here. To investigate the magnitude of underwriting and investments parameters, we refer to sensitivity analysis (2.2.1.4).

2.2.2.3. Valuation Outputs

P&L Statement	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Premiums written	4 981	5 431	5 941	6 481	7 026	7 607	8 227	8 889	9 597	10 353	11 163	12 030	12 959	13 954	15 021
Change in unearned premium reserves	-202	-225	-255	-270	-273	-291	-310	-331	-354	-378	-405	-433	-464	-498	-533
Premiums earned	4 779	5 206	5 686	6 211	6 754	7 317	7 917	8 558	9 243	9 975	10 758	11 597	12 495	13 456	14 487
Claims paid accident year	-1 989	-2 148	-2 324	-2 516	-2 710	-2 938	-3 181	-3 439	-3 714	-4 008	-4 321	-4 656	-5 013	-5 394	-5 801
Claims reserves accident year	-1 356	-1 497	-1 656	-1 832	-2 017	-2 235	-2 472	-2 731	-3 015	-3 324	-3 661	-4 030	-4 433	-4 874	-5 355
Claims paid previous years	-1 082	-1 174	-1 274	-1 386	-1 512	-1 648	-1 824	-1 998	-2 190	-2 412	-2 653	-2 918	-3 207	-3 521	-3 865
Change in claim reserves previous years	1 082	1 174	1 274	1 386	1 512	1 648	1 824	1 998	2 190	2 412	2 653	2 918	3 207	3 521	3 865
Claims Run-off	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commissions	-648	-688	-734	-779	-822	-888	-957	-1 031	-1 110	-1 195	-1 284	-1 380	-1 482	-1 592	-1 709
Change in DAC	26	20	23	23	21	33	35	37	39	42	45	48	51	55	58
Commissions incl. DAC	-621	-668	-711	-757	-801	-855	-922	-994	-1 071	-1 152	-1 239	-1 332	-1 431	-1 537	-1 650
Other acquisition expenses	-349	-371	-395	-420	-443	-478	-515	-555	-598	-643	-692	-743	-798	-857	-920
Operational expenses	-631	-670	-714	-760	-804	-852	-902	-955	-1 011	-1 071	-1 138	-1 209	-1 284	-1 364	-1 450
Total expenses	-1 601	-1 709	-1 820	-1 936	-2 048	-2 184	-2 339	-2 504	-2 680	-2 867	-3 069	-3 284	-3 514	-3 759	-4 020
Underwriting result	-167	-147	-115	-73	-22	-41	-75	-117	-166	-223	-293	-373	-465	-569	-688
Other technical result	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Investment income	377	418	439	447	493	544	600	661	730	805	888	978	1 077	1 185	1 304
Insurance result	211	271	325	375	471	503	525	545	564	582	595	605	612	616	617
Other income / expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total profit before tax	211	271	325	375	471	503	525	545	564	582	595	605	612	616	617
Taxes	-65	-84	-101	-116	-146	-156	-163	-169	-175	-180	-184	-188	-190	-191	-191
Total profit after tax	145	187	224	259	325	347	362	376	389	402	410	417	422	425	426
EVA	25	49	69	88	127	117	98	77	54	29	-1	-33	-68	-106	-145
Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discounted EVA	23	40	52	61	81	68	52	37	24	12	0	-11	-21	-30	-37
Sum of discounted EVA (MVA)	23	63	114	176	257	325	377	414	438	450	450	439	418	388	351

Profitability	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NAV b.o.p.	1 106	1 252	1 439	1 663	1 921	2 247	2 594	2 956	3 332	3 721	4 123	4 533	4 950	5 373	5 798
NAV e.o.p.	1 252	1 439	1 663	1 921	2 247	2 594	2 956	3 332	3 721	4 123	4 533	4 950	5 373	5 798	6 223
ROE	12,3%	13,9%	14,4%	14,4%	15,6%	14,3%	13,0%	12,0%	11,0%	10,2%	9,5%	8,8%	8,2%	7,6%	7,1%
CoC	10,2%	10,3%	10,0%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%	9,5%
Gap ROE vs. COC	2,1%	3,6%	4,4%	4,9%	6,1%	4,8%	3,5%	2,5%	1,5%	0,7%	0,0%	-0,7%	-1,3%	-1,9%	-2,4%

Value = NAV + MVA	1 457
Net Asset Value (NAV)	1 106
Market Value Added (MVA)	351
- explicit cash flows modelling (2002-2016)	351
- terminal value	0
- - ROE	9,5%
- - CoC	9,5%

Figure 16: P&L – the worst case scenario

According to the worst case scenario, MVA drops by more than 2/3 to 351 mio, as compared with the base case scenario. That is explained by lower premium growth than would be otherwise necessary to spread fix costs and to achieve positive contributions of economy of scale. The estimated value of 1457 mio can be understood as the lower boundary for negotiations.

2.2.3. Summary

Based on the performed valuation analysis, we can come back to the issues arisen by management and try to give the appropriate recommendation and conclusions.

The base case scenario represents the outgoing base for acquisition negotiations. We do not recommend going too much above this estimated amount. Nevertheless, if we considered some more optimistic assumptions, for instance concerning the determination of terminal value as illustrated on Figure 14, we could arrive at the upper boundary. The lower boundary is determined by the worst case scenario.

The key value drivers:

- Economy of scale
  - Premium growth
    - Growth of the whole insurance market
    - Company growth
  - Improvements in the operational efficiency
- Discount rate as embodied in the assumption about the stable economic and legal environment

This list of value drivers corresponds to the main uncertainties inherent in the valuation:

- The stable economic environment, growth of GDP
- The growth of the insurance market
- The standardization and competitiveness of insurance market
- The uncertainties inherent in the determined NAV
- Company growth perspectives
- Cost cuttings