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List of abbreviations

AFS: Available for Sale

CAPM: Capital Asset Pricing Model

COC: Cost of Capital

COE: Cost of Equity

FCFE: Free Cash Flow to Equity

DDM: Dividend Discount Model

GGM: Gordon Growth Model

RIM: Return Income Model

MCEV: Market Consistent Embedded Value

GEV: Group Embedded Value

ANAV: Adjusted Net Asset Value

M&A: Mergers and Acquisitions

OCI: Other comprehensive income

ROE: Return on Equity

VaR: Value at Risk

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Introduction

Motivation and interest for the topic of valuation arises from is practical application and analytical nature. The value of the company is pivotal fort the M&A procedures, credit capacity calculation, provision of the information efficiency on equity markets.

The topic of valuation is interconnected with the core topics of corporate finance and financial markets. The dividend policy is essential for the discounting of dividends, capital structure in imperfect markets and indebtedness play crucial role for the default rating of the company and the borrowing rate. These topics link the practical field of valuation to scientific areas with the broad discourse. Despite the fact that not all scientific theories are applicable in practice due to the complexity or not sufficient robustness, they allow the deep insight into processes beyond the face value of a price.

The recent development on financial markets connected valuation on the liquidity of investment assets and to the internal liquidity. This point is especially important for financial firms which are the object of the current research and analysis. This group of companies wakes a special interest. They challenge a researcher with interconnection of internal and external factors. Interest rate, economic cycles, GDP development and overall profitability on markets are essential factors to consider in the analysis of asset allocation and riskiness. The considerable leverage of banks and insurance companies forces them to develop an sophisticated asset liability strategy in terms of duration matching, maturity transformation and liquidity prices. Financial companies are dynamic and are exposed both in the product development and organizational structure to a technological change, especially trends in broad digitalization and sharing economy, as well as psychological factors. In response to competitive fin-tech providers in insurance, tailoring deposit contracts and investment products it is interesting how the value of mature banks or insurance companies will be changing.

Applying valuation theory and technics to fair value estimation related to all aspects mentioned above one can also question: Which procedure is more objective and simultaneously efficient? Which price s fair and what kind of benchmark should be established to prove this fairness?

This master thesis is designed and aimed at answering these questions and at gaining an in-depth insight in the valuation aspects, drivers, decisive key performance indicators, to check the time and effort as well as efficiency of the costs incurred in elaborating of the model, data mining and processing. The focus of this thesis is on insurance companies. The matter is the analysis of valuation models. Herewith the theoretical and methodological analysis of models will be paid considerable attention. Additionally, the practical example should provide the insight into advantages and disadvantages of models' application.

The thesis is organized as follows. The first chapter questions why the valuation of financial companies differs from non-financials. The second chapter analysis the scientific

discussion on the valuation models applied to insurance companies, giving priority to liabilities valuation and adjustment of costs of capital to the underwriting risk. The third chapter assesses the business model and revenue generation in life and non-life segments. The fourth chapter is dedicated to the financial statement analysis and their components, as well as problems of activation and profit recognition. The fifth chapter examines the advantages and disadvantages of key performance indicators and condenses the drivers for the life and non-life sectors. The emphasis of the sixth chapter is on Solvency Capital requirements and economics capital for insurance companies. The costs of equity will be analyzed and elaborated in the seventh chapter. Thereafter follows the practical part with some forecasting aspects. The object of the ninth chapter are the valuation models, their components and their interdependence. Herewith the fundamental and relative valuation is analyzed separately. The practical implementation applying valuation techniques to a multiline insurance company is a content of the last, the tenth chapter.

1. Why the valuation of financial institutions is different?

The first question regarding the objective of the master thesis is "Why the valuation of financial services differs from non-financial?". The discussion on this chapter will be dedicated to specific features of financial companies (banks, insurers) regarding regulation, leverage, the nature of the business in general as well as systematic risk assessment. Additionally, the basic models and aspects of valuation to consider will be discussed.

According to Damodaran (2013) the value of firms in general can be derived by two methods the fundamental or intrinsic valuation and the comparable or the relative valuation. While the first method draws on the cash-flow estimations and the risk-adjusted discount rate in the appropriate period, the second uses market benchmark of comparable firms. Applying these two methods to the valuation of financial companies an analyst is challenged by some distinct features of banks, insurance companies, or other financial firms.

First, the debt, reinvestment and consequently the cash flow is difficult to define. Second, the thorough regulation of the bank and insurance business with relation to their solvency and liquidity measures exists. The change in the regulation across regions and over time can imply significant changes in value while the other parameters could remain stable. The accounting conventions applied to assets to price them marked-to-market more frequently than in industrial firms.

The starting point for the analysis why the valuation of financial firms is different is the adaptation of fundamental models to them. Four models can be used: dividend discount model (DDM), the free cash flow to equity or discounted cash flow (DCF) model, residual income or excess return model (RIM), and asset based or net asset value model. These valuation models allow to derive the value drivers which are then used in the plausibility check or in the relative valuation models.

The very rough description of financial firm business models can look like that. The bank's profit comes from net investment income (NII), whereas insurers increase the value from premiums of policies and from the investment income until the benefits and claims are paid, the investment bank lives from advisory fees for investment research and price difference. It is reasonable to concentrate on the classical bank and insurance business model to grasp the difference in valuation models (Damodaran, 2013: 2).

Defining the difference of the business model of financial firms one should look at the capital needed to offset the risks (both financial and operational), accounting rules to record earnings and asset values, the nature of the debt or liabilities on the balance sheet, and the reinvestment (or the net capital expenditures and working capital).

Regulatory capital. The more precise calculation of the regulatory capital for insurance companies will be discussed in the separate chapter pointing out to the Solvency II and Economic capital role in the valuation models (especially in the residual income and the DDM (dividend

capacity)). Here it is important to note in general that the required regulatory capital and based on internal model risk buffer is pivotal for the existence of a bank or an insurer. The regulatory capital ratios are based on the risk exposure to ensure that claims and deposits are paid. This risk exposure emanates from the assets to be invested in. Commercial banks can be even restricted from investment banking activities (Glass-Steagall Act in the U.S.). That constraint has an impact on the reinvestment and consequently organic growth while valuing financial companies. The expected change in regulation itself can produce the uncertainty (ibid., 3-4).

The difference of earnings and book values measurement comes from two sources. Assets of banks and insurers are prevalently financial instruments (bonds, loans, securitized obligations with the sufficient market liquidity. It allows to price assets to market values (contrary to original costs). Additionally, the accounting standards in financial firms are developed to smooth earnings due to the periods of large losses (check it with data). The need to smooth earnings comes from the varying credit risk of debtors (asset side) over time. Instead of the one-time write-off of the bad credit provisions for losses are created to spread them over time (netting earnings). In turn, the bank should assess the loan losses. While the conservative bank will put more reserves aside than the aggressive banks it would lead to better results in good times.

While nonfinancial firms consider both debt and equity as capital to finance business, a financial firm uses actively only debt (provisions or deposits) to fund the assets. As mentioned, the equity is rather a buffer for losses based on the risk profile of assets and is used passively. Coming from the asset loss distributions the debt in financial firms can be sourced at a higher leverage than in non-financial firms with less effect on the costs of capital. The capital is then defined narrowly as equity. Debt in the narrow sense cannot be defined precisely. Interest bearing deposits and bonds are the biggest part of expenses and should be then calculated after the operating income. The degree of financial leverage is consequently high due to the historically predictable earnings and capital requirements. Consequently, small changes of assets have large impact on equity value (ibid., 5).

Cash flow estimation may be complicated due to the reinvestment constraints and growth patterns. In the non-financial firms the destinations of the reinvestment are net capital expenditures and working capital. In this sense the reinvestment in financial firms flows not into the tangible assets but into intangible as brand or human resources and can be categorized as operating expenses. Working capital as a difference of current assets and liabilities can be very volatile in financial firms. The consequences for the valuation methodology are that cash flows are not clearly defined without clear reinvestment.

Considering the intrinsic value of a bank or insurer in which dividends can be the only measurable metrics in a financial firm and the equity related models the most appropriate models. The problem to estimate the classical debt forces analysts to subtract all flows except flows to equity to provide the most accurate and reliable cash flow to discount. Estimating Free cashflow to equity as

FCFE = *net income*

- net capital expenditures

- change in non-cash working capital

- (debt repaid - new debt issued)

Missing one of these parameters forces to choose:

a) Dividends as approximation of free cash flow to equity assuming a particular pay-out ratio.

b) Adaptation of the FCFE model to expected reinvestments i.e. regulatory capital change

c) Excess return /residual income valuation

d) Use net asset value and debt approximation to estimate equity indirectly (ibid.,.6)

The analysis of those models and application to insurance companies is the subject of this thesis and will be provided in the future chapters. On this place the overview related to financial firms with the emphasis why they suit to valuate financial companies will be provided.

"In the Dividend Discount Model the value of a stock is the present value of the expected dividends on that stock" (ibid., 6). The complexity of FCFE estimation let this model be afloat among many analysts. Assuming that a publicly traded company has an infinite life

$$V_0 = \sum_{t=1}^{\infty} \frac{Div_t}{(1+k_e)^t}$$

Where:

V_0: Value of the company at the time point of valuation

Div_t: Dividends paid in the year t

k_e: costs of equity

In the special case of this model with a constant growth rate of dividends is the Gordon Growth Model (GGM).

$$V_0 = \frac{Div_t}{k_e - g}$$

Where additionaly:

g : constnt growth

(ibid.,.6)

A different picture can be developed in the cashflow to equity models. Redefining reinvestments allows to estimate the FCFE. The reinvestment takes a shape of the regulatory capital and determines the limits of the future growth. Regulatory capital defined as required capital being a function of the scale and risk of their business. The risk is based on two measurement principles: risk-adjusted assets (in case of a bank) which requires more capital if the assets are riskier; and regulatory capital which is the minimum capital. In case of insurance company also underwriting risk arising from premia volatility and specific risks should be accounted for. Implementing the FCFE model based on the determining the net income over time and the investment in the regulatory capital. The model boils down to:

FCFE = net income — reinvestment in regulatory capital

The required capital investment excesses net operating income in case of the under-capitalization and high assets growth. The negative FCFE should be covered with the new equity issue over time. In case of the positive FCFE it is discounted and claimed even without paying dividends.

The DDM and the FCFE model can bring the different results due to the following reasons:

- the pay-out ratio could differ from the dividend capacity or even in the best effort payable dividends at a managerial discretion
- the effect of dilution in case of negative FCFE should be considered in the DDM

Excess return models base on the expected excess returns from the current book value of the capital. Applying to a financial firm in general it is reasonable to concentrate on the equity as an investment base.

Value of equity = equity capital invested currently
+ present value of expected excess returns to equity investors

RoE in this particular case equals fair market RoE. This leads to zero economic value added and straightforwardly in case of deviations to above and below fair market return (ibid., 14). The inputs to model are the current equity capital and the expected excess return from the new equity investments in the future. The first one is measured as book measured at accounting conventions. It is quite stable in a financial firm due to the marked to market pricing of assets and the negligible depreciation of financial assets. It can be still affected by the exceptional events and charges. Consequently:

Excess equity return = (return on equity — cost of equity) x (equity capital invested)

In the financial firm the data on the RoE can be mined from historical records. The expected return can be estimated with the statistical models adjusting to the strengths and weaknesses.

In the asset based valuation the equity is valued indirectly. The debt and other outstanding claims are subtracted from the assets. Herewith, asset valuation is a separate procedure. The loan portfolio can be priced with the market prices or through the replication portfolio. The approach is usable to value the mature financial company with no growth. Thus, it does not consider the excess capital resulting from the growth of the excess returns. Additionally, the lending at the higher rate than the rated according to the default risk could be considered as an additional growth source. If the company is multiline, different interest rates can be applied to each unit (ibid., 12).

Summarizing, each model seems to be different in applying discount rates or cash flow estimation, but there is a similarity in the deriving value drivers. The risk, expected growth rate of earnings, and tempo of the growth.

Considering discount factor charge with the risk premia. IT is measured through the covariance with the market premia. Still, due to the equity valuation should not be levered /releveled. This aspect is discussed further in-depth.

Additional factor, the legal regulation, can de facto change also value due to the strengthening the earnings allocation. It still remains a question how to incorporate the regulation uncertainty into risk. And consider the uncertainty from macroeconomic conditions in emerging markets especially for banks or insurance companies (ibid., 12f.).

The nature of growth can be different across markets. For valuation of financial firms it is important to differentiate between the growth that creates value and the asset growth.

The relative valuation models base on the value drivers and metrics coming from the fundamental valuation but are simpler in terms of calculation. In this case, enterprise value multiples are useless in estimation of the value due to the above mentioned reasons: definition of operating income. Thus, the concentration will be on equity based multiples: price to earnings (P/E), or price to book (P/B) with variations. The former is driven by the expected earnings growth, payout ratio and costs of capital (COC) or Cost of Equity. The latter is driven by the growth of equity growth, payout ratio, and return on equity (Damodaran, 2013: 13-14).

The empirical perspective as outlined by Foerster & Sap (2005) shows that separating financial from non-financial firms in the empirical asset pricing tests affects the identification of risk factors and the corresponding betas. Some risk factors can change the sign for the financial firms and significance. The Fama-Mac Beth (1973) models can be rejected when financial forms are excluded from it, making thus possible the industry mixtures in asset pricing tests.

2. Scientific discussion on valuation of insurance companies

The master thesis pursues the methodological elaboration of the valuation of insurance companies, i.e. to gather the most optimal practices and models to get a fair value of the insurance company. It is thus reasonable to analyze the scientific point of view for some approaches and assess advantages and disadvantages for their use in the practice. The purpose of the chapter is to elaborate the analyze with the pros and cons for the use of methods to valuate insurance or banks (equity-based valuation) from the scientific perspective.

Damodaran (2013) hints on the fact that the equity valuation is possible both directly and indirectly. The latter in comparison to the former subtracts the value of liabilities from the assets to get the equity value. In fact, the liability centered method of valuing insurance companies seems to be efficient as the main value comes primarily from the technical provisions (Babbel et al (2002), Engsner et al (2017).

The indirect approach of the equity valuation could be applied through the valuation of liabilities on the market consistent basis. This approach refers to Solvency II requirements and allows the indirect valuation of equity as the difference between the total assets and total liabilities. Although, the nature of the insurance business brings some aspects to consider. For the live business line and the valuation of the value -in- force in the embedded value the valuation of liabilities takes the central role. Due to the high uncertainty of the long-tailed contracts the valuation of liabilities should be discounted with the higher risk discount rate including the higher risk premia. Engsner et al (2017) present the approach of market consistent "multi-period valuation of insurance liability cash flows based on a two-stage valuation procedure" (Engsner et al, 2017: 250). After the liability replicating portfolio of traded financial instruments is fixed, "the cash flow is managed by repeated one-period replication using only cash funds". (ibid., 250). Herewith, the capital requirements, costs, and limited liability and risk aversion of capital providers are considered. Costs of capital margin is considered as the value of the residual cash flow and related to the dynamic risk measurement. Solvency II requires market consistent valuation of liabilities at the arm's length principle considering dependence between future values of assets and liabilities. The difficulty of assessing liabilities cash flow may arise they are not replicable by other financial instruments. This fact makes complicated the risk assessment of liabilities cash flows over one year period. The imperfect replication results in residual cash flows to liabilities value. Portfolios that generate cash flows replicating expected aggregate liabilities cash flows are formed. The common practice is to build a portfolio of default-free bonds. Although, the difference between the original cash flow and the replicating cash flow is substantial. This mismatch is taken into account and requires normally the additional buffer capital form shareholders resulting in the additional capital costs. Technical provisions as the aggregate liability value is defined as the best estimate (discounted actuarial fair value) adding risk margin. The latter is however poorly defined and approximated through several formulas (ibid., 250). The approach presented by

Engsner et al (2017) focuses on the analysis of the cost-of-capital margin. The valuation approaches draws on "financial replication arguments with costs-of-capital considerations" (ibid., 251). The valuation is based on the financial principles considering conditional monetary risk measures and utility functions. Herewith, the dynamic risk measurement considers the repeated one-period application. The derivation the cost-of-capital margin considers the repeated one period replication and defined capital requirements in terms of VaR (in non-convex risk measures) with consideration of time-consistency (ibid., 251).

In this case, a portfolio consisting of "n" identical and independent term life insurance contracts. That is a contract that x years old individual for at least T years from today assuming that these contracts are independent events. For the valuation of the life insurance liabilities the EIOPA standards are widely accepted and used[1] (ibid., 260). In the result given the portfolio of N individuals the technical provision is the best estimate. However, the valuation procedure suggested by authors points out that the standard EIOPA procedure can under/overestimate risk in comparison to their procedure cost-of -capital margin.

Babbel et al (2002) pointed out to the fundamental approach used in the financial economics. Here, the whole life insurance valuation considers the additional costs of risk. As outlined above technical provisions as liabilities trigger the most discuses problem due to the uncertainty of cash flow. Here the financial economic factors such as default risk, pricing and liquidity risk of an insurance liability are taken as most important. From the fundamental point of view the risky cash flows form insurance liabilities can be valued through discounting of probability weighed future cash flows with risk-free rate plus risk premia. Additionally, the modification of probabilities of risky cash flows to discount only with the risk-free discount rates or modification of the risky cash-flow with adjustment for risk and discounting at risk-free discount rates can be applied. In the one period example the cash flow equivalence is achieved 1) through the discounting with risk premia, 2) through risk neutral probabilities, or 3) adjusting certainty equivalent. Valuing by discounting with risk premia is a traditional approach especially for less liquid securities. The second variant is based on the option pricing model for complete markets. The adjustment of the certainty equivalent depends on the utility function (which is difficult to establish). Applying call option pricing approach, one can consider the corporate securities as an option on the underlying asset with the given debt. The bond is then the difference of assets and equity value (ibid., 14). The decomposition of the liability into risk free bond and the put option accounts for the riskiness of liability (own default risk) (ibid.,15f.). However, the Black-Scholes-Model is applicable only to the fixed income debt. As it often happens the payments are depending on the interest rate and vary across time. In this case the multi-period models should be considered (ibid., 16). In the example of the bullet insurance liability product (general

[1] https://eiopa.europa.eu

insurance contract) is analyzed. Babbel et al (2002) insists on the valuation of it as a simple zero-coupon bond with the put option based on the martingale expectations.

Herewith mortality risk in the whole life insurance policy without any options poses the challenge for valuation due to the uncertainty of the surrender / lapse as a result of the interest rate spread (ibid., 18). Even more complicated is the valuation of the general life insurance contract. Due to the list of risks such as mortality, casualty, underwriting, operating, expense risk the uncertainty increases. Incorporation of those risk into the model of the interest rate risk should be priced in case if they are not diversifiable and correlate with the interest rate risk (ibid., 20). As an example should be used CAPM model. The additional risk is added to the market beta. As source of riskiness on the demand side is the moral hazard and on the supply side the adverse selection. If the demand side risks are not diversified the stock owners should provide the additional capital to support solvency (ibid., 22). The pivotal question in this sense the costs of equity with respect to the above mentioned risk factors. Often the orthogonal risk as they perceived from the demand side (by the insurance firm managers) are not equally perceived by the capital providers due to their dependency.

The value creation in the insurance company is discussed by Hancock et al (2001). They adapt the principles elaborated in corporate finance to analyze the insurance industry. Due to the regulatory requirements the insurance industry have the frictional costs that should be compensated through the additional charge on policies to create the value added for the shareholders. The risk underwriting should be sold at a premium to create the economic value. From the economic perspective (different to accounting rules) to capture the value of a firm the assets should be valued at the market prices and the liabilities at the best estimate. Reliance only on accounting principles of valuation can cause the cosmetic techniques: “smoothing result by the release of hidden reserves” (ibid., 3). Hancock et al (2001) suggests that risk adjustment should be taken into consideration while measuring the economic value creation process of insurance companies. The embedded value is the way to reflect this view (Hanckock et al, 2001:3). As liability driven business insurers have an advantage to borrow money in the less efficient insurance market (not like capital market) (ibid., 5). Still the main question of the valuation is the estimation the costs of capital. The option to default lowers the insurance value of liabilities cash flows. However, defaulting is not in the interest of an insurer as the significant amount of the franchise value is then lost. In this sense the owners of the capital set the (base) costs on the level of the closest leveraged investment. Additionally, the frictional costs arise from the financial distress costs, agency costs, regulatory capital requirements, double-taxation. Additionally, the excess liquidity should be considered. It result from the fact, that the cash flows from insurance products is predictable and in most cases cannot be resold. Consequently, the replication is based on the risk-free illiquid assets (different from the fair value of the illiquid assets considering the liquidity premium) (ibid., 7f).

Differing between two methods direct and indirect Girard (2002) suggests that the indirect method of liability valuation as more related to fair (exit) prices and easier adjusted to the financial leverage. The exit price should reflect the creditworthiness and CoC of the firm (Girard, 2002:18). According to the asset based or the indirect method the value of the firm is then the difference between the market value of assets and liabilities. With the direct method the liabilities cash flows are discounted by the modeled cost of capital (CoC) adjusted for risk (ibid., 18).

In the direct method to estimate the insurance risk (mortality and morbidity) can be incorporated into discount rates through the market value margin (MVM) The MVM is the difference between two expected cash-flows that is mimicking the market valuation of the risk (ibid.,19) using true (P measure) and risk-neutral probabilities distribution (Q measure). The MVM should be zero for orthogonal or insurance risks uncorrelated with the market risks. Arguing that insurance risk has zero beta the expected cash flow can be calculated under the realistic probabilities and discounted with the risk-free rate without adjustment to risk. Although the liquidity risk exists. This risk cannot be easily transferred to other participants and is changing with time. As discussed in Hancock et al (2001) own default or credit risk should be also accounted for the fair value of liabilities (also according to FASB)[2]. Girard (2002) however has an objective to estimate the insurer own credit or default risk and link it to the fair value (ibid, 19). At the end the direct and indirect method should result in the identical value independently of risk estimation. The direct method exploits risk neutral probabilities in the stochastic modeling of liability cash flows with the succeeding discounting by the risk-free interest rate. The cash flow includes liabilities and expenses for their service (ibid., 20).

The indirect method adds up cash flows produced by the supporting investment portfolio. Here Girard (2002) also refers to the option pricing method. Referring to the Modigliani Miller (MM) First and Second proposition, the value of subtracting the option to default from the liabilities reflects the First MM proposition (ibid., 23 f). While the stochastic modelling and risk-free discounting is preferred in determining the valuation, the risk premia considering the insurance risks (morbidity and mortality), interest rate risk plus premia and real probabilities could be considered in some methods. The reconciliation of two methods is achieved through the notion of required profit (ibid., 22). Application of the MM propositions by Girard (2002) to the insurance company valuation (assuming tax-free world) takes a form:

$$\mathrm{MVA} = \mathrm{DDE} + \mathrm{FVL}$$

Where:

MVA: the value of the firm's assets to both the firm's shareholders and policyholders.

DDE: the value of the firm's equity to the shareholders.

[2] Financial Accounting Standard Board, https://www.fasb.org/home

FVL: the fair value of the firm's obligation to the policyholders.

Considering the nature of the business of insurance companies FVL are the technical provisions minus the firms credit put option with respect to such liabilities. In accordance to Girard (2002) the liability valuation of insurance can be adapted to the MM in the following way:

Table 1 Reconciliation of Modigliani Miller theorems and liabilities valuation

	Original M&M	**Insurance Liabilities**
Prop I	*The value of the firms is independent of the capital structure*	*The value of the assets supporting the insurer's in-force business equals to the value of the distributable earnings and the fair value of liabilities*
Prop II	*The firm's cost of capital is linear dependent on its capital structure*	*CoC to discount distributable earnings is adjusted for the risk of financial leverage*

Source: after Girard (2002: 24).

The arbitrage free valuation framework is preferable due to its internal consistency in case when the liabilities are valued with the help of assets. Using the same assumptions both direct and indirect methods lead to the same value. Whereas the indirect methods allow arbitrage (as using the true probabilities), the direct method ensures internal consistency. Although the indirect method is normally used in the practice based on the COC approach (assumed that the firm is not expected to default on own obligations). The general insurance contract (GIC) can be used to establish the equivalence between the direct and indirect method. The incorporation of taxes equivalence of the direct method and cash flow discounting at assets, calculation of the leverage adjusted COC, used to achieve the fair value are independent from the investment strategy unless it influences the definition of labilities and credit risk premium (ibid., 40).

In practice, Babbel (2015) examines the Pension Benefit Guaranty Corporation's (PBGC) Pension Insurance Modeling System and its principle to discount the liability cash-flow with risk-free rates instead of replication through corporate bonds (ibid, 186).

Similar to the MVM concept of Girard (2002), Chen (2011) considers the joint dynamics of assets of the sponsoring firm and the pension fund assets to calculate the risk -based pension premium by the Pension Benefit Guaranty Corporation (PBGC). The author comes to conclusion that the pricing of this premia depends on the risk-portfolio of the pension fund and the sponsoring firm as well as the correlation of two portfolios. Administered by a pension fund (like a life insurance) benefits are financed by the assets of the pensioned fund. Although, the firm signs an additional contract with the PBGC, a state guarantor of a pension benefits in the USA from 1974. The default of several pension plan during the crisis of 2008 in the USA questioned also PBGC functionality. The results of the model suggest that the effective risk-based economically fair premium accounting for the credit risk of a firm, asset allocation risk and the correlation between assets of a firm and a pension fund is reasonable (Chen, 2011: 402

3. Business model analysis

This part will assess the insurance business model differences between lines related to valuation.

"Insurance companies provide their clients with economic protection for clearly identified risks that will take place within a certain (predetermined) time period." (Massari, 2014: 159). The basic model of insurance is quite straightforward: to share individual risks in the pool of common funds. As long as the correlation of contracts is not perfect, they can be diversified.[3].

The successful model relies on the actuarial calculation of risks for any client or group clients and requires the risk premium for it. The economics of insurance is based on the notion of risk aversion of a clients and resulting willingness to pay that premium to be safe in the case of an adverse event (peril). Risk averse people maximize their expected utility, a measure of relative satisfaction, by buying insurance policies *(compare also De Weert, 2011: 13 f.).*

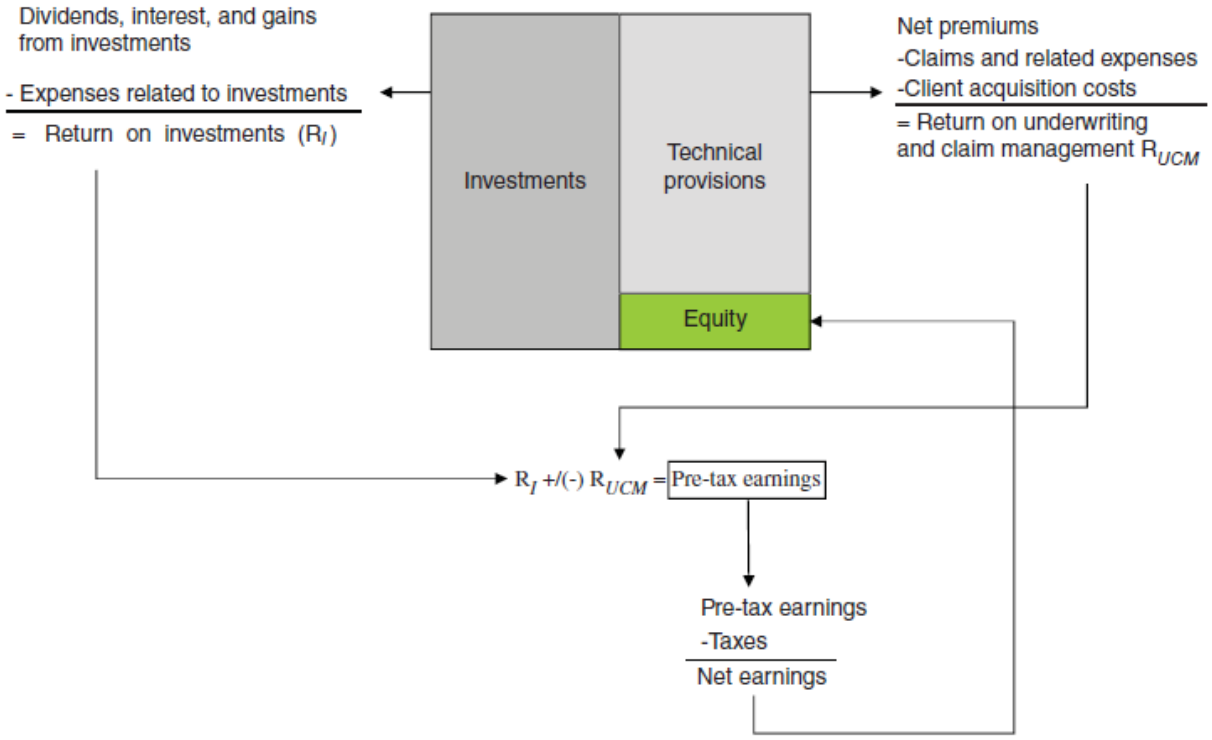
Beyond that the protection the considerable motivator to buy a life insurance contract is the tax advantage of life insurance annuities after the retirement. Insurance companies appear as a competent saving partner with all information at their dispose for the optimal investment (Sinclair et al, 2014: 4).

Depending on the severity of an adverse event (peril), its occurrence frequency, and claim volume the insurance business lines are divided into Life&Health (LH) or life in this work, Property&Casualty (PC) or non-life, Reinsurance (R). An additional business line, the insurance broker, that is counted to insurance, has basically a function of trading with polices.

Generally, all types of insurance lines have two features in common. Insurance companies underwrite insurance policies i.e. assess risks, contract terms of coverage and premiums, bill premiums, investigate and settle claims. Due to the time lag between the premium payment and adverse event occurrence the insurance company possess a positive "float" which are recognized in the income statement and the balance sheet as the reserves for losses and loss adjustment expense Insurance business includes two revenue generating activities: management of premiums and claims and the investment of premiums or a float. The unique model of insurance is that two side can compensate each other in case one is not profitable (Massari, 2014: 160). Schematically, the balance sheet could be exemplified as follows:

[3] The statistical foundations of the insurance business are the law of large numbers and the central limit theorem

Figure 1 The insurance company business model



Source: Massari, 2014: 160

On the one hand, the insurer lives from underwriting profit i.e. the difference of the premiums and estimated liabilities. The lump-sum or recurring premiums are used to fund future claims. The distribution and underwriting cause the acquisition expenses, e.g. the upfront costs that occur while selling insurance products. The premium which is required from policyholders to cover the expenses in case of an adverse effect fund reserves to fund future claims (in accordance to policy or insurance contract).

On the other hand, the asset side of the insurance firm is funded by premiums or technical provisions. The total investment income (including the nominal and interest rate income) should be enough to meet the future claims and expenses of policy holders. The forecast period of these claims may be decades. The main investing goes into fixed income securities. However, a part of insurance business comprises in investing assets for others on their own discretion. The spread profits arise when an insurance company realizes an excess over the guaranteed return for its customers (Massari, 2014: 160f.; De Weert, 2011: 12f., 18 f.)

Life insurance line provides polices for physical persons paying out benefits at the event. Firstly, benefits at the achievement of a certain age (pension, life annuities) or at the death (life insurance). This are contradicting business lines by their intention, because the former is interested in the shorter life of a client, the later in the longer life of a client. Consequently, they bear risks that is reflected in the firm's risk profile. The profitability depends on the proper calculation of mortality and longevity of a client or a cohort (a group pf person that was given birth at the same conditions in the same time (year)). The health segment is often included in the life

segment. This policy provides the protection in case of the adverse event of illness and bears the risk of morbidity (illness occurrence).

Non-life insurance line provides the coverage for the physical property (cars, houses), business failure etc. in case of an adverse event. In case of any casualty event it provides also benefits for physical persons.

Reinsurance line pools risk from many insurance companies in case they are exposed to risk of catastrophes. In this sense the reinsurance is the additional risk capital on the asset side of balance sheet. This is the niche industry. Under the reinsurance contract the insurer itself protect its portfolio. The reinsurance contracts can be mandatory to diversify risks in the financial system (ibid., 162)

The main difference that has an impact on the profitability and managing the assets is the period. Non-life lines have a limited and quite short policy horizon (1 month till 1 year) while life insurance has often long maturities of policies (ibid, 161). The distribution can be organized through brokers, independent agents, bank channels, tied agents, or direct selling (see also De Weert, 2011: 12-13). The special form of the distribution is the bancassurance. In this case a bank owns the client list and writes policies among them. The distribution policies have an impact on the balance sheet structure and are considered in the business plan preparation (Massari, 2014: 162).

The insurance companies provide often other types of business like asset management and fee-based investment. However, they do not have as large influence on intrinsic value as the core business (own asset management and underwriting business).

The main problem of the insurance is that outflows i.e. claims and benefits are not determined for sure especially for the long term contracts.

Table 2 List of typical insurance contracts

	Life		**Health**		**P&C**
Saving	Endowments	**Group**	In-patient	**Motor**	3rd party liability
	Unit Linked Annuities		out-patient		Casco
	Index Linked Annuities	**Single**	In-patient	**Non-Motor**	Property
Biometric	Term		out-patient		General 3rd PL
	Disability				Legal
	PPI (payment protection insurance)				Accident
					ST Health

Source: after www.uniqagroup.com

The contracts organization can also impact the revenue generation. It can differ across regions, obey the conventions and be also tailor to the needs of the clients. The policy can provide partial or whole insurance or include the claims threshold.

For instance, the term insurance contract, when the policyholder protects his / her life for the case of the premature death in exchange for the premiums paid to the insurer regularly or as lump sum. Mathematically:

$$Benefit\ (T) = \sum_{t=0}^{T} premium_t * (1+ r)^{T-t}$$

For the fair premium it is enough that the insurance premium (according to the risk-aversion of the insured person) equals the benefits plus costs of the insurer. The insured loses the benefit after the contracted term T, while the insurer writes it as earnings. However, the insurer should also consider the profit margin, so that the insurance contract is being never sold fairly to the insured person. The interest rate is either fixed or depends on market conditions.[4]

The main insurance risks influence the exactness of the fair premium calculation are stochasticity of claims and benefit, changing parameters and assumptions (e.g. demographics), data mining and misuse of data, information asymmetry between counterparties resulting in the adverse selection. The safety margin and accuracy of calculation are the main general solutions.

The revenue generation in the insurance industry is influenced by general trends such as strengthening the regulation, negative interest rates the growth in development markets are volatile. The M&A cycle is currently unwinding currently bringing more private capital into markets. The products are adapting to the current challenges of digitalization offering the cyber insurance or protection against the data fraud and loss. Additionally, the digitalization sparkled the development of sharing economy and contract customization. The climate change and more frequent catastrophe outbreak causes the increase of reinsurance share. [5]

4. Financial Statements Analysis

4.1. Balance sheet analysis

The purpose of this part is to provide an overview of the balance sheet resp. income statement and descriptive statistics on the aggregate level based on the sample of the companies from the S&P Market Intelligence Platform. The list includes 108 insurance companies from Europe of different business segments or multiline companies. The structure of the balance sheet can be presented as follows.

4.1.1. Assets structure

[4] https://www.investopedia.com/terms/t/termlife.asp (retrieved on 12.5.2018)

[5] https://www.insurancejournal.com/magazines/mag-features/2018/02/19/480659.htm (retrieved on 12.5.2018); https://www.pwc.com/us/en/insurance/assets/pwc-insurance-top-issues-2018-compilation-report.pdf; https://www.pwc.com/us/en/industries/insurance/library/top-issues.html (retrieved on 22.8.2018)

Assets can be grouped into 3 groups: investments, receivable from policyholders, other assets. The same way the liabilities can be reduced to the payables to policyholders (unearned premiums or future coverage for existing business, loss and loss adjustment expenses (for incurred, not reported losses, the costs of settling claims), other policyholder's liabilities, as well as debt (other liabilities, accrued expenses) and shareholder's equity. Considering the strict regulation of financial companies in general and insurance companies in particular the regulatory capital requirements is a reason to thoroughly assess the balance sheet. The quality and composition of the balance sheet, capital can change its structure. The assessment of riskiness of assets and corresponding capital sensitivity is important for valuation and respective analysis of balance sheet. For instance he intangible assets such as goodwill and deferred tax assets can increase the value of the business because it have to be amortized (compare de Weert, 2011: 135 ff.)

Table 3 The rough model of the insurers balance sheet

Assets	**Liabilities**
Intangible Assets	Shareholder's equity
Investments	Subordinated debt
	Wholesale funding
	Technical Provisions

Source: after De Weert, 2011: 19).

The difference between payables to policyholders and the receivables from policyholders is called float. In other words, the float is called also the time delay between the premiums inflow and the claims outflow. The float can be decomposed into four components:

- The time reflected in the balance sheet in *unearned premium liability*
- Gap between occurrence of the event (peril) and the subsequent payments, claim settlements, and insurance payments. They are reflected in the balance as *the reserves for losses and loss adjustment reserves* accrued after the occurrence of the insured event. (Nissim, 2010: 4)

"For a general insurer the major components of its float are reserves for unpaid losses, unearned premiums and other liabilities to policyholders less premiums and reinsurance receivable and deferred acquisition costs. Usually, it is possible to work out the float from balance sheet information but sometimes estimates are necessary".[6] The advantage of the float is its stability relative to premiums. After the Berkshire Hathaway methodology float is calculated as follows:

Float = net loss reserves (technical provisions)

+ adjustments

+ assumed reinsurance funds

[6] http://www.theactuary.com/archive/old-articles/part-4/insurance-3A-float-based-valuations/

+ unearned premiums (often the part of technical provisions),

- receivables for insurance purposes

– acquisition costs paid upfront

– taxes and charges for assumed reinsurance paid upfront."[7]

Table 4 Asset side analysis on the aggregate level

	All		Life		Non-life		Multiple	
Number of companies	108	100%	24	22%	54	50%	30	28%
	total	avg	total	avg	total	avg	total	avg
Total assets	8163858	77751	3240161	135007	626394	12282	4297302	143243
Total assets *			40%		8%		53%	
Total capitalization, mln EUR	736944	7840	163 419	8171	258738	5505	314 787	11659
			22%		35%		43%	
Total equity	635204	5 882	137682	5136	143191	2652	354331	11811
			22%		23%		56%	
Net income after taxes, mln EUR	57053	549	13 949	606	15527	299	27576	951
			24%		27%		48%	

*as a share of the total number
Source S&P MI Platform, drawn on Nissim 2010, 69;

On the aggregate level the balance sheet has the following structure. Out of 108 European insurance companies 24 are the life, 30 multiline and 54 the non-life companies. It is obvious that non-life companies are the biggest part by number are very poor in total assets in comparison to life and multiples. Here should be stressed, that multiple line insurance companies are dominated in their structure by life business accumulate therefore the relatively largest part of assets. The same is valid for the market capitalization. The statistics are skewed to the multiples. Even more focus on multiples as prevailing in the equity allocation, twice as the number of companies. However, these is the ultimately rough analysis, it gives the hint about the competition structure and value biases on the insurance market.

Table 5 Assets structure of insurance companies on the aggregated level

	All	Life	Non-life	Multiline
Intangible Assets,%*	3	1	4	2
Total Investments,%	68	79	56	81
Cash & Cash Equiv, as Reported, %	8	3	12	4
Reinsurers' Share of Reserves, %	5	4	8	2
Deferred Acquisition Costs, %	2	1	3	1
Other Assets, As Reported, %	16	13	21	8
Investments Excluding Unit-Linked, %	54	47	50	66

[7] http://www.berkshirehathaway.com/2017ar/2017ar.pdf (retrieved on 22.5.2018); https://www.quora.com/How-do-I-calculate-an-insurance-companys-float

*In percent of total assets. Source**:** S&P MI Platform, drawn on Nissim 2010, 71;

It is evident from the Table 5 that multiline and life insurers have the biggest share of investments in their total assets. However, they have also a large up to 33% on average unit linked investments [8] These unit-linked investments are especially voluminous in specialized life insurers and do not bear the risk for them but for the policyholder. They are also treated as asset under management (AUM) and contribute by the fee-based income to the revenue. Additionally, the non-life insurers due to the short maturity of contracts hold higher percentage of cash and equivalent on the balance sheet up to 12%. The share of other assets is considerably higher contrary to the multiple and life. Importantly for non-life is to secure business with the reinsurer share of reserves (receivable with reinsurer).

4.1.2. Investments structure

Table 6 Investments structure

	all	life	non-life	multiline
Gov't Bonds and Similar*	33	20	31	44
Corporate Bonds	24	15	26	26
Total Equity Instruments	14	24	14	8
Total Derivative Assets,	1	1	2	1
Investment Property	7	7	9	4
Other Financial Assets	1	2	1	1
Total Assets Available for Sale	43	21	42	60
Fixed Income and Loans AFS	38	19	35	55
Total Investments	177	231	109	135
Total Securities	74	68	75	77
Investments Excluding Unit-Linked	100	100	100	100

*In % to investments excluding unit linked (separate accounts)
Source: S&P MI Platform, drawn on Nissim 2010, 103;

The investment structure of business lines differs significantly across business lines. The life line bear less risk on the liability side but invest considerably more in equity instruments 24%

[8] Separate accounts are established by life insurance companies to be distinguished from other funds, used primarily for pension plans and variable life products. Investment income and investment gain accrue directly to the contract holders, who also assume the risks. This arrangement permits wider latitude in the choice of investments, particularly in equities. For European insurers this consists solely of unit-linked contracts. (S&P Mi Platform, Glossary)

Unit-Linked – Policyholder benefits under such a contract are expressed in units of an underlying investment vehicle, e.g. an investment fund, instead of being expressed in currency terms. As a result, they fluctuate with the value of the units and investment risk is transferred to the policyholder. An annuity in which the benefits vary with the investment experience, but the insurer absorbs the mortality and expense experience. Unit-linked assets are part of the insurer's separate account and the policyholders bear all the investment risk for these products. In the US, they are called variable life/annuities. (Sinclair et all, 2014: 57)

in comparison to 8% in multiline companies. However, all lines are not differing in the main investment portfolio share. Securities, government, corporate bonds comprise 68% in life lines and 77% in multiline companies. As it is evident from the large picture of the asset side the unit linked securities make the picture of life line companies considerably different also in the investment structure. Additionally, the assets available for sale are much larger in multiline and non-life resp. 60% and 42% in comparison to 21% in life line. It is compensated by the assets hold to maturity and the longer maturity of contracts. Due to the considerable share of the fee-based business of life insurers the total investments are on average more than double in comparison to investments excluding unit-linked.

Considering the investment return, the investment income is calculated applying the effective interest rate method. That is "the product of the at-purchase yield and amortized costs at the beginning of the period" (Nissim, 2010: 104). It should be noted, that investments in securities include both the fixed income and equity (without control function). Multiline and non-life have significant part in the liquid (available for sale assets). Both held to maturity and bonds and available for sale securities bring interest income and gains resp. losses. In the balance sheet held to maturity securities are recognized at amortized costs while trading and AFS are accounted at fair value. (ibid., 104) The realization of gains and losses is usually discretionary. Thus the unrealized gains and losses should be treated with caution resp. excluded from the recurring income.

Asset liability matching or management (ALM) is an important factor for investment result. Since the assets are dependent on premiums and their characteristics such as duration, riskiness, regulatory requirements they should be appropriately structured. Structing assets according the quality depends on their risk of default, required reserves and ability to cover liabilities in terms of liquidity. Investment strategy is always a trade-off between risk and return. ALM function to match balance sheet as close as possible in terms of maturity and duration to avoid interest rate risk and liquidity risk on the balance sheet is crucial. Regulatory requirement include stress testing of assets and liabilities. The mismatching leads either to liquidity costs or to additional cover by required capital reserves. Due to the fact that there is no perfect match how the liabilities are linked to the value of assets the policyholder should share investment risk. As liabilities in life business line are of the longer nature their optimally require the investment in the longer assets (equity with all characteristic of price time series). If guaranties are in place bonds are more likely. In case of non-life assets, the shorter duration are preferred and bonds is a suitable assets for it. Still the fixed income instruments are the prevalent investment. The equity-based assets are reduced due to the high risk weights and higher reserve requirements. As high rated bonds became more scarce, investments in lower credit rating assets increases (Sinclair et al, 2014: 36).

4.1.3. Liabilities structure

Table 7 Liabilities structure on the aggregate level

	All	Life	Non-life	Multiple
Shareholders equity, %*	20	8	29	13
Subordinated liabilities, %	1	1	2	1
Underwriting provisions/ insurance reserves, %	56	48	59	59
Underwriting provisions for the AUM/sep.acc, %	11	26	3	13
Non-underwriting provisions, %				
Total debt, %	7	5	6	10
Tax liabilities from income tax, %	<1	<1	<1	<1
Deferred tax liabilities, %	1	<1	1	1

*percentage of total liabilities

Source: S&P MI platform, drawn on Nissim, 2010: 72 f.

Analyzing the liability structure of European insurance companies on the aggregate level one can detect considerable differences between life and non-life lines. First, the shareholders equity is three time bigger for non-life and more than double of that of multiline. It could be explained by the higher surplus capital due to the Solvency II requirements (see in the separate chapter on the Economic capital). As expected the non-life and multiple have much higher insurance reserves (technical provisions) for risk bearing contracts in comparison to the non-life 59% against 48%. On the opposites side life insurers have high unit-linked (or separate accounts) without risk bearing but earning the fee revenue 3% against 26%. That is indicative and will have impact on the risk capital what is already evident from the higher equity (including own capital and surplus).

According to the Nissim (2010: 71 f.) both on the asset and on the liability side the separate accounts (or unit linked) dilute the balance sheet and deter the valuation. It is reasonable to exclude them from valuation. As it is explained previously the technical provisions or insurance reserve multiline can include both liabilities for future policy benefits for life lines and claim reserves for non-life lines (compare to Nissim, 2010: 76).

4.1.4. Reserves or technical provisions

Based on the IFRS accounting system claim reserves (or technical provisions) represent estimated future payments to settle claims related to insured events that have occurred by the balance sheet date. *While the non-life lines have loss reserves, life lines have the liability for policy and contract benefits*. Technical or underwriting provisions also insurance reserves on the liability side on the balance sheet instead of deposits are “the best estimate” of the net present value of future claims net of net present value of future premiums. This stochastic nature of

technical provisions depends on many parameters and needs elaboration of valuation model itself.

The insurance reserves comprise *of liability for future policy benefits* (in life line) (LFPB) and claim reserves (non-life line), as well as reinsurance reserves. The former category on the balance sheet is the sum of the present values of the future benefits and additional expenses related to them net of present value of future net premiums (compare Massari, 2014: 162 ff.).

Loss reserves in non- life are In particular, "claims that have been reported to the insurer but not yet settled and claims incurred but not reported". *In this sense they are economically but not in the accounting sense settled*. The estimation is based on the "historical experience and actuarial assumptions considering effects of current developments, anticipated trends, and risk management programs" (Nissim, 2010:76*). Liability for policy and contract claims* are similarly estimated final costs of life line contracts added up from benefits to the policyholder for the death, disability, long-term care. Those benefits or claims are incurred but not reported,or reported but not settled (incurred but not settled or before settlement). Similarly, decisive are the actuarial assumptions and historical data and adjustments are recognized in the period of changing assumptions or incurred payments. It should be noted that the estimation of loss reserves are often biased and calculated at discretion due to the large range of uncertainty (ibid., 77).

The more uncertain loss reserves (from non-life) have an impact on the surplus, risk capital, on "income taxes, financial reporting and, primarily, regulatory metrics that are used to monitor insurers' solvency (surplus, risk-based capital)" (Nissim, 2010: 77). In this case the understatement of reserves artificially increases "reported policyholder surplus" and underwriting capacity. In turn, it allows to decrease the premiums (especially in the non-life).

On the other hand, the overstatement of reserves is a signal that the insurer wants to decrease the income taxes, "to smooth reported income", to increase premiums or even to indicated the accounting quality. Another strategy to manipulate the balance sheet is to overstate reserves to gain form the tax reduction reduce the present value of income tax payments (ibid., 77).

One large piece of distortion comes from undiscounted reporting of claim provisions except for some items ("being settled workers' compensation claims and loss reserve for financial guarantee insurance"). The time span between incidence of a loss and the settlement of the claim accelerates this distortion. Additional adjusting item, "loss and the loss expenses", in the income statement comprises from the loss reserve change, claims settlement expenses net relevant reinsurance recoveries express as estimated costs. The problem described above forced the regulator body to impose on an insurer the regular reporting and detailed disclosure of loss reserves. They are useful for the reliability and tail assessment (ibid.,78-79; compare Massari, 2014: 164 f.). The estimation of the loss reserves is based on the past experience and adjustment for the current trend considering the cohort (the group for claims with identical features). Among other method of estimation are:

- claim ladder method based on the proportionality of accumulated and emerging losses and stable growth pattern “link ratios” or coefficients of growth),
- “case incurred loss development factor model based on the growth in cumulative case incurred losses (adding accident losses and reserves)
- Reported claim development method based on the ultimate claim counts for a cohort]
- Frequency to severity value method or average cost per claim fitting to severity of an event
- Expected loss ratio method (for more see Nissim, 2010: 82)

The liability for the policy and contract claims as registered on the life insurer balance sheet are the estimated disbursement for any incurred death or disability (reported or unreported) or not settled before. They also reflected in P&L immediately (US GAAP). The discretion with which estimations are being made could be the part of the earning and capital management strategy, compliance with regulation, or the tax minimization The reason is that the underwriting capacity is increased with the increase of policyholder surplus (Massari, 2014: 164 f).

Separate accounts comprise the net return (without fees) to contract holder. They are not constructed by the insurer and backed on the asset side by the diversified portfolios. The risks are then being born directly by the contract holder. They are not incorporated into the regulatory capital except for fees fluctuations (ibid, 165). The NII on separate accounts is excluded from the P&L as well. Notwithstanding, the performance of those investments are considered for the forecasting management fees (ibid, 166).

A liability for future policy benefits (LFPB) is “present value of future benefits to be paid to or on behalf of policyholders, including related expenses, less the present value of expected future net premiums”. (Nissim, 2010: 86). Basically, it is the discounted difference of benefits and premiums arising from the contract. The notion of a float (the time gap between the cash inflow and outflow) is decisive to recognized positive difference between the benefits and premia (not vice versa) as a life line value.

The simple calculation of the respective to guarantee the life surplus (LFPB):
gross premium charge =
collected premiums
+ investment income from the particular contract
- administrative and marketing expenses
- taxes
+ future losses provisions
-dividends

Where,
net premiums = gross premiums - embedded underwriting profit (reinsurance cession).

This is the portion of premiums devoted to cover future benefits and expenses

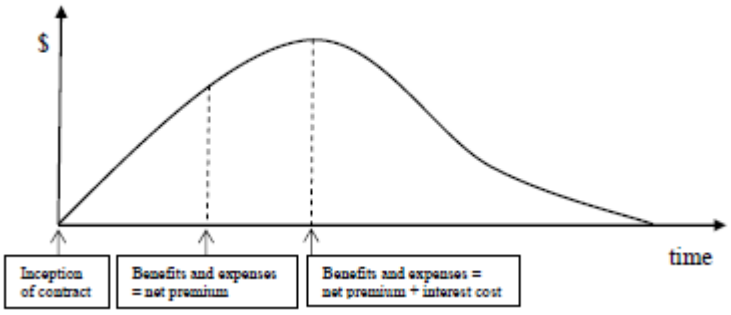
Following the principle of equivalence, the net present value premiums should equal the present value of future claims and expenses (considering the adverse deviations). According to US GAAP the lock-in concept, the assumptions should be present until the premium deficiency appears (a loss over a group of contracts measured as difference of "old" and "new" discounted gross premiums estimation of liabilities net of DAC) (Nissim, 2010: 86)

Additionally, LFPB include provision for the risk of adverse deviation or the risk load in non-life lines. This provision account for unfavorable deviation from assumptions made i.e. investment yield, mortality, morbidity, terminations (lapse, surrender). This risk premium is being made valid at the inception of a contract. *The gross premiums are then changed with respect to the yield changes, benefit adjustments to match the present value equality. However, original assumptions are being still used following the "lock-in" principle despite the premium deficiency until the relevant period. Then, the present value is recalculated. (ibid., 86-87).*

The premium deficiency arises in case of the probable loss on a cohort of insurance contracts from unfavorable conditions i.e. investment yield, insurance risk, terminations, expenses. It is an excess of the revised liability over the difference between the recognized liability and deferred policy acquisition costs. Although, the revised liability does not include the risk provision for adverse deviation and discount the gross not net premium with an offsetting effect to avoid economic loss (this risk provision is then included in the underwriting premium). Thus, *the premium deficiency measures the net economic costs in contrast to the recognized costs before revision*. Premium deficiency is the income statement item. The premium deficiency checks occur periodically. Similar to the claim revision the recognition of the premium deficiency is subject to the discretion so that managers can manipulate income (ibid., 87-88; Massari, 2014, 163 f.).

Related to this problem, net investment yield at the origination of the contract is reflected in the discount rate. The return rate considers the current interest rates, their projections, portfolio diversification, as well as maturity of contracts (Massari, 2014:163). **"Discount rate** is the net investment yield that the insurer expects to earn on the premiums at the inception of the contract; it is estimated considering actual yields, trends in yields, portfolio mix and maturities, and investment expenses" (Nissim, 2010: 86). The discount rate is always an object of discussion regarding the risk premia and the base of the risk estimation, replication assets or liability itself. Due to the time gap and discounting effects expected net premium are larger than benefits at the inception of the contract, equalizes over time due to the increase of liabilities. The latter increases even over premiums up to the point when interest costs becomes equalizes the difference between benefits and premiums. From this self-financing point the nominal benefits / liabilities are decreasing (ibid., 87). This is typical for the health contracts.

Figure 2 Liability for future policy benefits dynamics



Source: Nissim, 2010: 87

"Policyholders' benefits expense, calculated as the total of benefit payments during the period and the change in the liability for future policy benefits**".** Herewith the LFPB are measured at present value of future payments, so that they are highly sensitive to interest rate changes. Thus, they include the interest charge at the beginning of the year (like bearing an interest already at the beginning). The decisive assumptions for calculation are the mortality and interest rate, as well as relevant surrender. Additionally, the LFPB can include guaranteed benefits and unearned revenues. Those guaranteed can include a minimum return, minimal deposits in the adverse event, minimum income, specified date or at withdrawal benefit (ibid., 88).

Revenues recognition and expenses categories related to reserves depends on the contract maturity (time horizon). Both in life and non-life products with short maturity report premiums as revenues in amount of their insurance protection. In case of life premiums, if the benefits are much longer than the premiums the profits should be deferred. Both in investment contracts and universal life policies the administrative and surrender fees are reported as revenues (Massari, 2014: 166). Major revenue related premiums consist of premium receivables and unearned fee premiums.

On the other hand, expenses are less distinct in the future. Especially, benefit expenses related to liability for future policy benefits, their disbursement and reserve amendments, and computed on the present value and bear interest costs on the start of the year (ibid.,166). Losses and loss expenses are separated in the income statement of calculated as "all estimated costs for claim settlement during the year and estimate changes to settle prior year claims" net of compensation from insurance contracts (ibid., 166 f.).

Other special insurer balance sheet items are the deferred policy acquisition costs (DACs). This is an intangible asset and arises from the smoothing upfront costs such as (administrative or distribution costs) at the time of the contract policy selling and including it in the premium (of new contracts). If the premiums are calculated wrong i.e. the difference between the up-front costs and the actual costs should be charged in the premium. If the premium is fixed or linked to an equity index and the market conditions are changing not favorably. The process is called as DAC unlocking (De Weert.,2011: 20). The life DAC are as expected higher than the non-life. According

to IFRS DAC are balanced as an asset or contra liability account. Value of the Business Acquired (VOBA) is the second significant intangible asset. It is the fair value of (present value of future profits) in the life line i.e. the acquired costs of benefits of already existing acquired contracts (Massari, 2014: 167).

Discretionary participating features (DPF) depend on the fact that some deviations in assumptions or risks transferred to the policyholder through the performance linkage clauses. Competition or regulation, or the insurer performance influence the amount of the participation by the policyholder (ibid., 171). At the same time the guaranteed elements are not conditioned on the issuer and set bilaterally. Guaranteed element is recognized as liability and considered in the valuation. DPF can be recognized also as an equity (ibid., 172).

4.1.5. Shareholder's funds equity

The own capital of the insurance company consists of share capital, capital reserves, retained earnings and other reserves. The intangible part of equity can be considerable especially in the growing companies. The role of equity and shareholders' funds is discussed narrowly with the Solvency Capital regulation.

4.2. Analysis of the income statement

Figure 3 Consolidated income statement of VIG

CONSOLIDATED INCOME STATEMENT

in EUR '000	Notes	2017	2016
Premiums			
Premiums written – gross	15	9,386,040	9,050,968
Premiums written – reinsurers' share		-800,787	-810,623
Premiums written – retention		8,585,253	8,240,345
Change in unearned premiums – gross		-82,947	-72,735
Change in unearned premiums – reinsurers' share		7,256	23,646
Net earned premiums – retention	L	8,509,562	8,191,256
Financial result excluding at equity consolidated companies	16	881,526	912,188
Income from investments		1,586,950	1,416,088
Expenses for investments and interest expenses		-705,424	-503,900
Result from shares in at equity consolidated companies	17	42,754	46,621
Other income	18	223,149	150,449
Expenses for claims and insurance benefits – retention	19, M	-6,872,588	-6,753,449
Expenses for claims and insurance benefits – gross		-7,366,621	-7,085,077
Expenses for claims and insurance benefits – reinsurers' share		494,033	331,628
Acquisition and administrative expenses	20, N	-2,040,282	-1,907,805
Acquisition expenses		-1,769,054	-1,665,277
Administrative expenses		-414,666	-381,370
Reinsurance commissions		143,438	138,842
Other expenses	21	-301,572	-232,526
Result before taxes		442,549	406,734
Taxes	22	-69,958	-85,744
Result of the period		372,591	320,990
thereof attributable to Vienna Insurance Group shareholders		297,596	287,778
thereof other non-controlling interests		7,052	4,246
thereof non-controlling interests in non-profit societies		67,943	28,966
Earnings Result per share* (in EUR)	8	2.23	2.16
Result of the period (carryforward)		372,591	320,990

*The calculation of these figures includes the proportional interest expenses for hybrid capital. (Undiluted = diluted result per share)

Source Vienna Insurance Group, 2018

4.2.1. Revenue recognition

The revenue recognition of insurance companies is directly tied on the maturity of the contract what corresponds to the business lines. Recognition of premiums as revenue and revenue related accruals in short-time contracts is possible over the contract period proportionally to the protection provided (Nissim, 2010: 95). In the long-term contract of life lines (also annuities) premiums are recognized as revenues at the moment when they are due from policyholders. In case of longer contracts the profit is deferred and tied to in-force contracts or FPBP. The revenue excludes however investment contracts and universal life-type policies. They are passivated as deposits and credited to policyholders account balances resp. separate account investments. As it was described above hey bear instead the fee-based income. Another source of related income is surrender charges, mortality and expense risk charges, administration fees. They are recognized in the period of service provision (ibid., 95-96).

From premiums earned they usually subtract the premiums ceded to reinsurance expired in the current period. This results in the net premiums earned. Where earned premiums are premiums written less the unearned premiums (cash inflow from the insured before the corresponding period, the part of float and technical provisions). (ibid., 96)

*Deferred policy acquisition costs (DAC) consist of administrative "*costs necessary to sell and issue a policy" (commissions, salaries and benefits, and other costs). While life lines report the DAC in one asset item with Value of Business Acquired (VOBA) what is "fair value of in-force contracts in a life insurance company acquisition". The fair value of VOBA underlies the list of actuarial assumptions. DAC are amortized (under IFRS and US GAAP) over the periods of revenues' earnings but measured under the discretion and large variations. The amortization is the part of income statement. For short non-life policies the DAC are a smaller part of assets and can be amortized in the year of expense (ibid., 97). Herewith the accounting quality related to DAC can be damaged due to the manipulations with DAC inflation, amortization, or premium deficiency offsetting (ibid., 99).

Reinsurance contracts are used for the indemnification of the insurance risk assumed to be high. The ceded premiums are the part of the assets and should reflect the risk born by the regular insurance contracts. The reinsurance is the insurance of insurance and demands same approaches of risk determination and actuarial science as in regular insurance contacts. Another way to account for insurance risk it to deposit the amount with accrued interest. Both methods are based on the cash flow estimation of liabilities. The reinsurance ceding is a subject to estimation and use of assumptions and can lead to decrease in accounting quality. (ibid., 100 f.). Especially using the subsidiaries or part of holding does not cede the risk to a third party.

Separate accounts is an instrument used for the variable universal life contracts and deferred annuity contracts. They have a nature of mutual funds and are usually diversified. The accrued interest net of fees are accounted to contract holder. Both asset and liability side is accounted at fair value. The income form separate accounts include management fees, risk and surrender charges (ibid., 110).

Debt and derivatives are not he largest part of balance sheet. Debt accounts of about 7% in the sample of 108 insurers in 2017 and consists of subordinated and senior debt e.g. bonds, notes, loans and lease obligations. It accounted normally at historical costs with amortization costs adjustments (ibid.,.111 f).

An accounting quality issue may arise with the early debt retirement. The early debt extinguishing can bring the non-recurring gains and losses that are highly discretionary and transitory. Other transitory items are the differences from fair value due to interest rate changes or from credit profile (in case they are fair value options on debt). This causes unrealized gains and losses. However, in case when there is change from historical interest rate the interest expense is accounted. (ibid., 112 f.) Both convertible and unreported debt can also bring some distortions in the book value of debt and equity based valuation of the company.

The use and value change of derivatives in insurance companies is if little importance due to the small share of derivative on the balance sheet. Under US GAAP resp. IFRS all derivatives are measured at fair value which is however difficult to establish (ibid. 115 f)

The main revenue driver in insurance companies recognized in income statements is insurance premiums. Although, there is a mismatch in the income and expense recognition. Usually, the reported expense is higher than the economic expense due to the undiscounted nature of former. This leads to the understatement of income and overstatement of expenses especially in the long tail non-life claims. For life insurers is also important to have a stable spread between liabilities and assets obligations resp. investment income. Due to the high leverage ratio of insurers this is a primary income for sub-industry. Also, fees are an important income source (Nissim, 2010: 74). The analysis of the income statement of 108 insurance companies of different business lines and size brings the following insights.

Table 8 The analysis of the income statement on the aggregate level

	all	life	non-life	multiline
Gross Premiums Earned	97%	97%	97%	98%
Ceded Premiums Earned	13%	13%	14%	10%
Net Premiums Earned)	85%	85%	84%	88%
Insurance Total Fee & Commission Income	6%	5%	8%	5%
Equity Accounted Results	1%	3%	1%	1%
Realised Gain on Securities	4%	1%	4%	4%
Insurance Total Return on Investment	20%	21%	20%	21%
Net Claims and Benefits	79%	112%	52%	83%
Insurance Other Underwriting Expense	26%	32%	27%	22%
DAC Amortisation	4%	1%	7%	4%
Pre-tax Profit	11%	15%	10%	9%
Income Tax Expense	2%	3%	2%	2%
Net Income before Extra	8%	11%	8%	7%

*in % of gross premiums written

Source: S&P Mi Platform, drawn on Nissim, 2010: 74

As expressed as the share of gross premiums written the largest part of an income comprises of net premiums earned. They practically identical in the sample of companies across all lines. The second one (as was also calculated by Nissim (2010: 74) is the investment income that comprises about 21%. The realized gains on securities and fees and commissions comprise the small part of revenue resp. each about 5%. There however considerable differences across expenses. While the administrative costs (other underwriting expense) are roughly 26% a bit bigger across life and smaller across multiline, net claims and benefits vary. In the life line (excluding some outliers) claims and benefits are still higher than the revenue what should cause the underwriting loss. Whereas for non-life this indicator is about 50% what should bring to the high underwriting profit. In fact, all companies have had in 2017 positive net income before extra roughly 8% to 11% of gross premiums written.

4.3. Accounting conventions, quality and their impact on the valuation

There are three forms of insurance accounting: cash, IFRS, embedder value (EV) each with different ways of profit recognition. The common feature for all accounting conventions is the challenge of estimation of costs of goods sold (COGS) in the insurance sector. In particular, in life the complexity is caused through the long-term contracts. They have contracts “in-force” to generate cash over time. It is easier to estimate the COGS in non-life as these companies follows the common rules of accounting (similar to non-financial companies).

*Cash accounting (CA) r*ecognizes cash profits on emergence. CA writes business that is shorter than break-even but is does not recognize risks from the long term business. Also growing companies sales cost are recognized upfront but revenues collected only over time. The quality and format of CA is not unified across insurance companies.

*IFRS p*rofit progression is smoother than in CA. The acquisition costs are spread over the life of the policy. Although, IFRS does not represent nether value added nor cash available to shareholders. Deferred acquisition costs (DAC) and intangibles are used to smooth costs over time through the appropriate amortization in the period. To some extent IFRS can be subjective and not consistent across companies. With IFRS assets are measured at market value while liabilities at book values (Sinclair et al, 2014:22).

Embedded Value (EV) is a discounted cash flow of an existing book of business. By nature, it is an economic forecast adjusted for risk in the business. It reflects the value added in the given period. EV does not consider expected new business unless a company writes new policies. In this case the discounted value of expected profits over the policy is added to EV. EV has a large room for discretion especially with respect to assumptions. The new business’ future value is created but not realized by companies is rewarded. Many products in the EV are long before break-even. Using the EV for accounting or valuation managers may have an intention to invest into the risky products as higher profits are recognized immediately (ibid., 22)

To compare the three accounting conventions there is the huge difference between the EV and cash in the recognition of profits of a life policy in the beginning of time horizon. However, despite the difference in timing of profit recognition of the theoretical cumulative profit over time should be equal (ibid., 23).

Table 9 Comparison of accounting conventions

	GAAP	IFRS	S2/MCEV
Principle	Conservatism /prudence*	Fair value(FV)	FV
Fair value on		assets	assets and liabilities
Time horizon	Short term	Long term (economic)	Long term (economic)
Reporting	limited	intensive	intensive
Reporting target	External: dividends and taxes	Investors, analysts	Investors, analysts, authorities
Volatility of data	Low/stable	middle	high

Source: www.uniqagroup.com (own compilation)

In quality of the earnings source is decisive for the risk assessment according to IFRS. The main sources for the IFRS earning accounting to be predicted are the non-life investment spread, life investment spread, underwriting and fees. They differ in the timing, maturity, stability (volatility), recurrence, and risk bearing. The latter is also decisive to apply the discounting rate. Underwriting profit has the highest quality, is relative stable, the risk is born by the insurer. AUM fee is the most stable, the risk born by customers. Investment spread is not stable, the risk born by the insurer.

Another factor affecting the earnings recognition and forecast is the accounting quality itself. According to Nissim (2010: 68), it depends on the factors like "complexity of the underlying transactions and related accounting treatment, uncertainty associated with the transactions and reported amounts, and the extent of managerial discretion involved in measuring and reporting transactions" (Nissim, 2010: 68). While complexity of transactions is more characterized for life insurers, the uncertainty is more specific for non-life insurers. The managerial discretion depends rather on the systems of standards. It is supposed that the US-GAAP provides less discretion of an accountant than IFRS. The insurance accounting under the IFRS is based on the IFRS 4 issued in 2004. It defines the insurance contract, separates it from the financial contract under the IFRS 39 and regulates the rights and obligation under this contract. The IFRS 4 will be replaced by the IFRS 17 from 2021 that is expected to be more transparent and unifying across firms[9] (Sinclair et al 2014: 27). For instance, DAC as the part of the equity structure can dilute the value of company. Under the IFRS the intangibles are given less importance (ibid., 28).

The main purpose of the IFRS 4 is the definition and recognition of risk transfer as an insurance contract. Special focus is on the separation of investment and insurance contract, recognition at the fair value of some equity guarantees, time pattern of the contract (such as the time principle of the contract), testing the recognized liabilities and impairment test, derecognition of liabilities. Under the IFRS 4 wide range of practices are permitted, what makes this accounting

* An accounting principle that requires recording expenses and liabilities as soon as possible, but the revenues only when they are realized or assured. Also called conservatism principle. [9]
https://www.iasplus.com/en/standards/ifrs/ifrs4?set_language=en (28.8.2018);
https://www.ey.com/de/de/issues/ifrs?WT.mc_id=10710051 (28.8.2018)

system partially less transparent across countries. However, the last trend is aimed at unification and transparency.

Under the IFRS the insurance contracts can be considerably different as from US GAAP. Insurance contracts according to IFRS define the insurance risk with its possible sources, i.e. uncertainty of an event, timing of an event, the magnitude, health condition, change in value of assets, survival risk. A policy without insurance risk is considered not under IFRS 4 but under IFRS 39 as financial instruments. (Massari, 2014: 168 f).

Under the requirement of the IFRS 4 the estimation of all future contractual cash flows and ancillary expenses should be carried out. The deficiency (the difference between cash flows and expenses) must be recognized in the current P&L.

Unbundling or separate accounting for some components of the insurance contract is mandatory if, in fact, the insurance and deposit component are separately measured, insurance accounting conventions do not require recognizing all rights and obligation from the deposit components (deposit components treated under IAS 39). The economic risk of the embedded derivatives should not be related to the main contract (separately measured). For instance, the surrender option is similar to the put option and gives the option to terminate the contract and receive surrender value (ibid., 170). The additional information on the development of the new standards IFRS 17 see on pages of the IASB or FASB.[10]

5. KPI and value driver analysis

Balance sheet and the income statement drivers can be grouped into:

Table 10 Drivers systematization

Item group	Drivers
Balance sheet	profitability, accounting quality, book value growth, equity risk, long term interest rates
Income statement	earning growth, accounting quality, earning payouts, equity risk, long-term interest rates

Source : Nissim (2010: 122)

[10] https://www.ifrs.org/groups/international-accounting-standards-board; https://www.fasb.org/home

5.1. Life insurance revenue drivers

It should be noted, that the ratios are tied to the business lines profit generation. As it is visible from the income statement analysis the largest items in revenue generation are the underwriting premiums, investment income (spread margin and realized gains), and fees und the assets under management or unit linked assets. Additionally, it is important to consider the quality of these earning sources as the riskiness or volatility differs. Underwriting profit considered to be the most stable followed by spread margin and fee-based profit.

Underwriting policies

This is the highest quality earning source. Based on the frequency premiums are paid regularly or uniformly. Mode of premium payments influences the assessment of regular or new business. (ibid., 12). For the measurement of new business the following indicators are informative

- APE (annual premium equivalent) = Regular Premiums + 1/10 of single premiums
- PVNBP (Present Value of New Business Premiums) = Sum of discounted premiums from a new contract to be received from the contract duration
- VNB (Value of New Business) = Estimate Value of New Business sold on the embedded value basis
- Net Flows = Gross inflows – Redemptions and Outflows (Sinclair et al, 2014: 12)

Spread revenue

The policyholder is guaranteed a minimal return (on a policy) whereas the insurance company invests it on a higher margin. The market risks arise due to the unprecise duration matching of liabilities. As the life business has on the balance sheet longer term liabilities, the risk adjusted assets cannot be sourced at some point. For some products the insurers spread can be negative but compensated by positive spread of other products in the total spread. The sensitivity to market risk can pose significant volatility in the valuation. As the investment yield falls, the insurers can impose the costs of falling yield on a customer. When the crediting rates are above the minimal guaranteed, then the company has a room for discretion. The concept of profit sharing between policyholder and shareholder guarantees the minimal return to a policy holder but also excess sharing.

*Asset based f*ees are fees that earned for the administering of asset under management (AUM) including the spread fees on the market price change and tax wrapper fees (coming from tax advantages). Due to the fact that the AUM maintenance bear also cost, the difference of the profit margin and expense margin increases with the volume due to the economies of scale. what

is a source of additional profit. on Profit margins is another profit driver. The While revenue margin staying stable, the expense margin reduces due to the economies of scale.

*Profit = AUM * (revenue margin – expense margin)*

(Sinclair et al, 2014: 14 -15).

5.2. Non-life insurance revenue drivers

Non-life insurers pool funds for protection of insured against the adverse events (perils). The primary insurance comes down to the customer (a unit of exposure). The structure of non-life earnings differs from those of life due to the shorter maturity of contracts and nature of events. The car and related insurance is the biggest segment of non-life.[11] Underwriting earnings are the main source of non-life companies. It is generated when expected costs of claims incurred in a particular period (if even paid later) and administration expenses does not exceed the premium income for these policies. Formally is melts down as:

Combined Ratio (COR) = (Claims + Expenses) / Net Premiums Earned (NPE)

Whereas, Net Earned Premiums: NWP time proportioned over the contract period upon the marginal maturity of claims i.e. premiums from contracts for which the protection has been paid. NEP depends on Gross Premiums Written (GPW) or all premiums written within the year. COR is an indicator for the performance analysis and should be under 100%. Lower COR indicates the higher profitability. The COR depends on NPE and claims and expenses. Considering the cession of premiums to reinsurer or translating the part of risks

Net Written Premiums (NWP) = (GWP - ceded to reinsurers).

While the relation

NPW /GPW ≈ NPE/GPE = Retention ratio
NPE is the start of net income calculation in the period.

Herewith the loss ratio and loss expense ratio merged to the loss ratio indicating the cost of underwriting business. The underwriting expense ratio is an indicator for the operation efficiency of the underwriting segment as it consists numerically of broker fees, salaries, special taxes, and other costs (Nissim, 2010: 127). The problem mentioned is that premiums opposite to

[11] https://www.insuranceeurope.eu

the losses and expenses are undiscounted (ibid, 126). On this place the underwriting profit or loss should be linked to the investment income. In case of the combined ratio is under 100% the insurance is “borrowing” money at negative interest rate. Otherwise the underwriting loss is considered as economic costs of investments and subtracted from the investment income.

Loss ratio fluctuates from 11% to 90% across 108 European insurance companies (SNL Financials). With the fluctuation of the expense ratio between 3% and 111% an d the COR 80% and 183%, the averages are respectively 65%, 29%, and 96%. That indicates on the profitable underwriting business on average with however considerable volatility across firms. The COR is 97%, 96% and 92% for non-life, multiline, and life segment. The high profitability of life segment is apparently due to the smaller non-life contracts and more exact estimation of expense ratios.

The estimated or incurred claims consists roughly of paid losses and reserves for future payment (reported and incurred but not reported) (see the subchapter with the income statement analysis). The COR depends also on the (average) lag of the contract as the costs incurred during the claim settlement belong to the administrative expenses. The longer the lag the more volatile are expenses and the more undefined are provisions. The movements in reserves causes on the P&L reserve releases resp. strengthening, which can distort profitability (Sinclair et al, 2014: 18). As reported and underlying COR differs, this difference comes from the including of reserve movements and impact of catastrophes. The reported COR is a “key headline”. The underlying COR considers only the current year and usually higher due to the reserve releases.

Underwriting margin in non-life segment correlates with pricing or underwriting cycle which is the result of supply and demand interaction differing by region and product. The entry barriers influence also the pricing cycle (personal less because of the distribution network). Catastrophes and pool events force the demand. Reserve movements have impact on COR. The reserve release has a positive effect on COR in combination with positive surplus what stabilizes prices (ibid., 19)

Similar to the life line investment income in the non-life line is generated on the reserves invested in profitable assets and depends on duration of liabilities. The longer the average duration of them the larger the volume of reserves what extends the investment horizon. **Fees is** the most straight forward earning source with a high profit margin and depend on a product.

Additionally:

Gross (net) cost ratio = acquisition expenses in non-life / gross (net) premiums earned
Loss ratio = Insurance benefits (claims)/NPE

The investors perspective in the insurance business is similar to the perspective on other firms with the emphasis on risk and financial leverage. The financial indicators such as beta, debt ratio are still significant indicators with respect to the size of the insurance firm. Highly leverage

business such as insurance requires attention to the risk profile. On the other side the overall high leverage allows to consider it as he business specifics.

5.2.1. Profitability drivers

Return On Equity (ROE), recurring ROE, and one-time ROE. These

ROE_t = *Comprehensive Income (to common shareholders)*$_t$ / *Common Equity* $_{t-1}$

For the business in general to be profitable the ROE > k_e or costs of equity which in directly relates to the risk of equity (ibid.,.123). To connect ROE with the underwriting and investment activity:

*ROE = Underwriting margin * underwriting leverage (UL)*
*Where UL = premiums to equity * CR*
Or
*ROE = Investment leverage * Investment yield (IY)*
*Where IY = invested asset to equity * yield*

The variations of ROE depend on the stability resp. time dynamics of ROE. For the forecast of ROE it is important to consider its mean reversion property in the long run. From the economic point of view the mean reversion occurs due to the increased competition in the long time horizon and decrease of abnormal profits completed by reinvestments resp. dilution of the capital. Additionally, the accounting quality such as recognition of unrealized gains and losses, leverage effects may impact speed of the mean-reversion (ibid, 123). Also bath effect (immediate recognition of losses while delayed recognition of gains), gap in the profits, occurrence of transitory items, volatility of ROE (ebd.124).

Recurring ROE = Recurring Income $_t$ / *Common Equity* $_{t-1}$
Resp.
One-time ROE = Recurring Income $_t$ / *Common Equity* $_{t-1}$

Where the recurring income from all business activities is the income excluding one time items that are not likely to materialize in the next periods. It increases the precision of the forecast. Under the non-recurring items are understood **"other comprehensive income" (**unrealized gains and losses) extraordinary items, income from discontinued operations, impairment charges, asset write-downs, restructuring charges, (net of related income taxes) (ibid., 125; Massari, 2014: 126). Herewith the biggest material transitory (on-time) items are gains and losses on investments (securities) and losses and expenses that are taken as estimates at the discretion and adjusted

consequently. Although excluding ***Accumulated Other Comprehensive Income (AOCI)*** makes the book value also discretionary (Nissim., 2010: 125 f).

5.2.2. Earning drivers after the loss ratio

The operating ratio measured as

Operating ratio = (COR - Net Investment Income Ratio (NIIR))

Where

NIIR = NII / NPE

NII = Investment Income - Investment Expenses

The indicator “excludes other operating income and expenses, capital gains and losses, and income taxes” and is intended to measure the current overall operational profitability of the non-life business. Similar to the combined ratio the under 100% indicates on the profitability of the overall operation insurance business. As the NIIR measures the income contribution of the float from previous periods, it tends to underestimate the current float profitability. Considering the growth (positive or negative) additional time series could be useful to avoid the distortion of the company’s value float profitability, especially with the prevalence of the long tail policies (bid., 128).

Underwriting leverage (UL) = Net Premiums written / Policyholder surplus

Where the policyholder surplus identical to the shareholders’ equity.

The underwriting leverage is a measurement of “the efficiency with which the insurer uses its capital resources to generate business” Form the one side the low UL is an indicator of inefficiency, from the other side the conservative approach saves policyholders form the dilution and can be use as the growth buffer (ibid., 128).

$$\textit{Investment yield}_{r} = \textit{NII}_{t} / \textit{Investment assets}_{t-1}$$

Investment yield is a measurement of the investment performance. This indicator should be adjusted to the risk. The latter differs in non-life investing in the short term low risk assets and life investing in the lifelong polices with the high risk premium. The markets function also self-regulating. Provided assets reported at fair value have abnormal yield the value increases and the yield normalizes. The historical rates should be used with caution as they do not reflect the future yield rates. The volatility can also distort the value without denominator adjustment. Additionally, the high investment yield is a hint to check whether the investment are overstated (ibid., 129).

Similarly, investment return is an indicator that combines the balance sheet and the income statement. It measured as

Investment Return = (NII_t + NET Gains (Losses) on invested $Assets_t$) / Investment assets $_{t-1}$

and complets the Investment Yield indicator with the gains or lossess on the asset price resp book vlaue. It is intended to measure the current performance. However due to the trnasitory nature of gains and lossess it is often distorted by the one-time items (atleast partially ofset by the liability side) (ibid., 130).

5.3. Accounting quality indicators

By its nature the accounting quality is not the real driver. Although several indicators of it can give an insight about the value measurement distortions and bias correct real drivers. Several important indicators of the accounting quality of the balance sheet, income statement and the growth should be explained on this place. They are:

- *Recurring Revenue-to-Equity Ratio,*
- *Loss Development Ratio (for PC insurers),*
- *Premium Growth,*
- *Revenue Mix Ratios,*
- *Book-Tax Difference Ratio,*
- *Effective Tax Rate (ETR).*

Recurring revenue to Equity $Ratio_t$ = Requiring $Revenue_t$ / Equity $_{t-1}$

It reflects the net asset turnover. Net assets measured as the difference between the total assets and the liability less equity is practically the equity of the insurance company. Recurring revenue or the revenue attributable to ongoing operations should be supported by the capital. It indicates on the earning quality because it can point out to the overstatement of the equity due to the understatement of liabilities (e.g. technical provisions), infliction of DAC, understatement of the DAC amortization.

Reserve Development $Ratio_t$ = Reserve $Development_t$ / Loss $Reserve_{t-1}$

It measures the adjustment of the reserve (technical provisions) in the current period relative to the existing reserve. The reserve dynamics measured in form of time series give insights about the loss reserve esimate quality thanks to obtaining new information from year to year. The adjustment themselves are often excluded from the underwriting profitability measurement, but

can inform on the measurement precision. The ongoing positive adjustment can indicate on systematic error in estimation. However the mining information on this ration can be time consuming and is reasonable only for the specific analysis. (ibid., 131 f.).

Premium growth rate as a measurement of the premiums dynamics across periods or sub-periods is an indicator for the non-life insurers writing the log tail policies. The positive (negative) growth rate can indicate on the income understatment (verstatment) due to the undiscounted nature of the losses and loss reserves. Larger scale omiting of interest expense on premiums in the time of growth than overstatment of lossess (due to undiscounting) leads to income understatement (ibid., 132)

Annual Premium Equivalent (from the report) the indicator for the non-life new business measurement. It contains 100 % of new regular premiums an 10% of new single premiums assuming the 10 year life of the regular premium.

Net Premiums Earned, NII, Fee Income relative to the sum of all indicates on the strength and quality of main earning source. As mentioned above the higher volatility or the lower persistency of the source can be indicative of the company or earnings riskiness (ibid., 132; SNL)

Book- tax difference ratio = (After Tax Income – Tax Earnings) / Book Value of Equity

Where the tax earnings is used as the proxy for the permanent earnings. Thus the negative or low ratio is an indicator for the sustainable income which is not manipulated with tax non deductible items such as amortization or impairment (ibid., 133)

The effective tax rate (ETR) *calculated as*

ETR = income tax expense / pretax income

is a measurement of the sustainable income. The abnormal ETR based on the pre-tax income with non-taxable transitory items (ibid., 133).

5.4. Growth indicators

The balance sheet or income statement items' growth such as revenue, equity assets, dividends size and profitability based on historical data is used for the estimation and benchmark. Insurance specific growth ratio premium growth or the written to earned premium ratio. Considering the earning growth several problems can occur in forecasting.

Recurring revenue shows more persistency because it is not impacted by fix costs and transitory items. Revenues are also more balanced and less exposed to shocks due to effect of business combinations as investments. Financial companies include however gains and losses from securities that can impact revenues both by low persistent realized or one-time item

unrealized items. For these reasons the gains and losses on securities are often excluded from revenues to predict growth. (compare Nissim, 2010: 134).

Specific to the underwriting business the premiums growth rate is more stable and can be used as proxy for the all revenue growth (including the revenue mixed ratios (premiums as share of total revenues). On the other hand, premiums growth should alert about negative risk implications of the extended exposure to underwriting risk.

Due to the premium decomposition in written and earned, the ratio of premiums written to premiums earned can be used as an indicator for the company maturity. According to Nissim (2010: 135) in mature companies this ratio net premiums earned is comparable to net premiums written in the current year leading to the ratio approximating 1 (one), less than one for growing companies.

Dividend growth and payout ratio can be also used as a proxy for the earning growth. Although this growth indicators should be used with caution, as not all companies are inclined to pay dividends.

The *equity growth* can be also approximated for the earning growth given the stable historical data. It is assumed that the additional equity will be used for the premium growth resp. earning growth leading to the higher ROE. Additionally, the own capital surplus is needed to provide solvency obeying the international risk capital regulation (Nissim, 2010: 135 f.). Although, equity growth can be seen also as the conservative investment policy due to the opportunity costs of investments.

Based on the correlation across segments *the asset growth* is a possible proxy for the earning prediction. Although in financial and specifically in insurance companies, the funding on the liability side plays the primary role, so that assets can be seen as the effect rather than the reason. The assets in financial companies generate revenue in the form of NII that is only share in revenues. Similarly, the acquired asset growth from intangibles (VOBA) is a worse predictor comparing to the organic asset growth (ibid., 136).

5.5. Macroeconomic and industrial influence factors

An important indicator that can be tied to the profitability and growth prospects is the penetration (insurance premiums as % of GDP). As a result, the penetration correlates with GDP growth.

While comparing the life and non-life the attention should be paid on the sensitivity to macroeconomic factors. In the maturity transformation the life companies tend to make longer investments in the longer maturity bonds. This causes the higher duration of those assets and exposes them to macroeconomic shocks such as yield curve movements, GDP dynamics). Moreover, the assets should be inflation protected to cover the customer claims and related expenses. The non-life business is more claim sensitive (or to claims' inflation) depending on the

legal system and driven by pricing cycles. The increase in claims is tied to the demand in the reinsurance claims.

The reinsurance in turn is driven by the demand and supply of the capital on the macroeconomic level (e.g. after the catastrophe the demand is higher than before). Moreover, the demand for non-life is more stable. This transforms into the higher beta of life and lower beta of non-life insurance lines (in the multiline insurance companies). The market of insurance in Europe is quite concentrated on the composite insurers with the capitalization of 40% on five biggest (Sinclair et al, 2014: 9)

The value of liabilities moves with the value of corresponding assets and the insurance business depends on the development of bond, equity markets and as the primary reason on the macroeconomic indicators.

Table 11 Sensitivity to macroeconomic factors

Macro factor	**Life**	**Non-life**
Equity markets	*Strong direct dependency*	*Strong direct dependency*
Interest rates	*Strong direct positive dependency*	*Neutral*
Yield curve steepness	*Strong direct dependency*	*Neutral*
Equity market volatility	*Strong invers dependency*	*Neutral*
Economic activity	*Strong direct dependency*	*Neutral*
Benign claim environment	*Neutral*	*Strong negative influence*
Inflation environment		*Strong inverse dependency*
Credit spread tightening	*Strong direct dependency*	*Strong direct dependency*

Source: Sinclair et al (2014:45)

Additionally, the equity markets positive dynamics increases the asset under management fees. Guarantees to policyholders become out of money when the bond yields increase what causes the positive reaction for investors on markets. As the life companies have more bonds in their portfolio they are more sensitive to bond yields movements. (ibid., 46).

Regional insurance stocks have strong correlation with the corresponding equity markets. In case when the assets under management (unit linked investments) fees are large part of earnings the correlation tends to be stronger. Life companies are tied closer when they have guarantees on the considerable equity portfolio. The non-life companies depend heavily on the pricing cycles and GDP moves (ibid., 47).

The changes of regulation in the area of solvency, sales practices, tax allowances have the large impact on the insurance profit. The European risk capital regulation Solvency II is treated in the upcoming chapters. The tax legislation change could be a source of risk as it is often the object of political discussions (ibid., 48). As has been discussed earlier the liability discounting based on the replicating assets can be influenced by the Solvency regulation. Practically, the weaker rating of bonds or higher riskiness of equity causes the higher discounting of liabilities.

However, companies strengthened EC Solvency II ratios prior to the implementation of it in 2016 (ibid., 49).

Additionally, to the macroeconomic factors the demographic change brings the new challenges for the insurance. The annuities (if not contracted) have to be paid for a longer time. The pension reforms can prolong the working age so that retirement starts later. The underwriting risk resp. change in actuarial assumptions can bring considerable change in claims and benefits outflows (compare Nissim, 2010: 143).

6. Economic capital and solvency regulation

Insurance companies are making their profits due to the risk pooling abilities. However, in simple words, the adverse unforeseeable events occur also for insurance companies. The USA based companies use three systems of solvency regulation Insurance Regulatory Information System, Financial Analysis and Solvency Tracking System, and Risk Based Capital (RBC). The later is by the idea close to the European and international based Solvency and measures the ratio of the policyholder surplus to the minimum capital requirements (Nissim, 2010: 32) The RCC systems is an economic based system that accounts for the asset structure, asset liability mismatch for several types of risk, and risk covariances. The five stages of the RBC ratio from over 200 % to under 70% regulates the action plan and the regulator authorities to take control over the insolvent insurer (ibid., 33)

The Solvency I regime is based on the formal approach calculation liability risks with no account for the asset risk born by the insurer. Under the Solvency I regulation the insurers had to hold more than 100% of the SCR I expressed in the solvency ratio.

Solvency I is calculated as follows:

Available capital = Shareholder's equity
+Minority equity
- Goodwill
+Free reserves
+Qualifying subordinated debt
+Certain off-balance-sheet reserves

Where required capital has a deterministic absolute form and calculated as

Required capital= 4% of traditional life reserves
+1% of unit-linked reserves
+16% of non-life Net Premium Written

(Sinclair et al, 2014: 31)

The economic capital (usually applied in banks) considers the set of risk born by the whole company and the risk management system, quality of assets, capital charge on assets i.e. additional no risk bearing assets for the diversification purposes.

Economic capital is the amount of capital that a firm, usually in financial services, needs to ensure that the company stays solvent given its risk profile. Economic capital is calculated internally, sometimes using proprietary models, and is the amount of capital that the firm should have to support any risks that it takes.

The measurement process for economic capital involves converting a given risk to the amount of capital that is required to support it. The calculations are based on the institution's financial strength (e.g., credit rating) and expected losses. Financial strength is represented by the probability of the firm not becoming insolvent over the measurement period and is the confidence level in the statistical calculation. Most banks use a confidence measurement of between 99.96% and 99.98%, which is the insolvency rate expected for an institution with a AA or Aa credit rating. The firm's expected loss is the anticipated average loss over the measurement period. Expected losses represent the cost of doing business and are usually absorbed by operating profits.[12] The calculation of economic capital is more clear in the example.

> *"A bank wants to evaluate the risk profile of its loan portfolio over the next year. Specifically, the bank wants to discern the amount of economic capital needed to absorb a loss approaching the 0.04% mark in the loss distribution corresponding to a 99.96% confidence interval. The bank finds that a 99.96% confidence interval yields $1 billion in economic capital in excess of the expected (average) loss. If the bank had a shortfall in economic capital, it could take measures such as raising capital or increasing the underwriting standards for its loan portfolio in order to maintain its desired credit rating. The bank could further break down its loan portfolio in order to evaluate if the risk-reward profile of its mortgage portfolio exceeded its personal loan portfolio."*[13]

It should be noted that risk assessment and the calculation of the capital that is able to absorb risks both on the asset and liability sides has been undertaking since years by rating agencies. For instance S&P capital calculation is reflected in the economic capital or solvency capital requirements respectively was applied in the stricter internal models prior Solvency II or Basel II implementation (Nissim, 210: 46)

Available capital =

Shareholder's equity

+Minorities

-Goodwill

+Free reserves

+Qualifying subordinated debt

+Certain off-balance-sheet reserves

[12] https://www.investopedia.com/terms/e/economic-capital.asp

[13] *https://www.investopedia.com/terms/e/economic-capital.asp#ixzz5EWrJKnuM*

+50% of In-force Value (VIF)

+Non-life reserve discounting

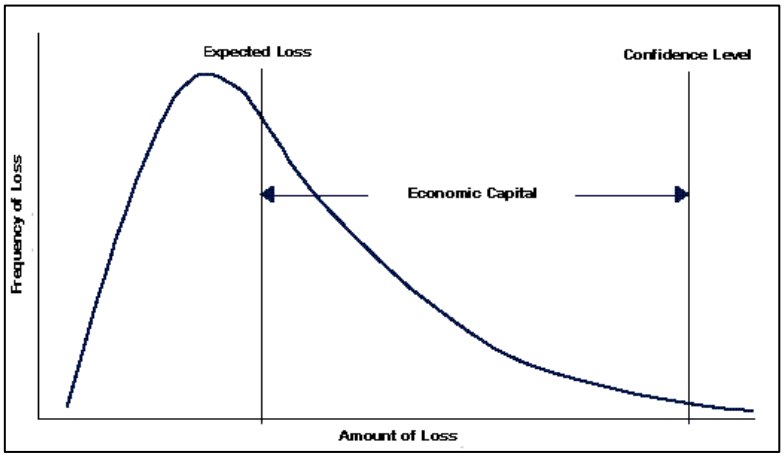
-Life DAC and 50% of Acquired VIF

+/- Some other adjustments

Required capital has a significantly more complex calculation with charges for both liability and asset sides. Capital requirements are dependent on rating and nature of risk (liability). The rating agencies model becomes prevalent in assessment of economic capital and almost the same as S&P Rating (see Sinclair et al 2014: 31).

The Solvency II framework exploits the Value at Risk concept based on the 99,5% confidence interval. T represents the ability of the company to survive the peril once in 200 years (0,5% probability of occurrence without accounting for big tails of the risk distribution) after its occurs. (compared Weert, 2011: 61). The relationship between frequency of loss, amount of loss, expected loss, financial strength and economic capital can be seen in the following graph:

Figure 4 Relationship between frequency of loss, amount of loss, expected loss, financial strength and economic capital.



Source: www. Investopedia.com

Additionally companies impose on themselves the binding constraints i.e. the percentage of the economic capital considered to be reasonable. For instance, 125% or the BBB credit rating by S&P. The Solvency II is considered to be the "binding constraint" for many companies. (Sinclair et al 2014: 31 f.).

The calculation of economic capital and their use in risk/reward ratios reveal which business lines a financial company should pursue that maximize the risk-reward trade-off. Performance measures that utilize economic capital include return on risk adjusted capital (RORAC), risk adjusted return on capital (RAROC) and economic value added (EVA). Business units that perform better on measures can receive more of the firm's capital in order to optimize risk. By the idea, RAROC is usually measured across lines, to compare business segments or

companies of the comparable size or portfolio. It is based on the concept of economic capital. It is defined as

RAROC = Expected net earnings / Economic Capital

Where the expected net earnings should cover types of risk to adjust for (e.g. expected defaults on a mortgage backed securities or loans), and economic capital "quantifies unexpected loss" (De Weert, 2011: 171). This change the ratio to

RAROC = Expected net earnings / absolute value of unexpected loss

From this perspective RARoC is different from Return on Capital, which measures the performance of capital form the accounting perspective as

RoC = Net Earnings / Available Capital
and does not consider the risks taken.

Given the positive difference between the available capital and the economic capital the surplus return should be deducted from the denominator as it generates risk-free return so increasing the RAROC relative to ROC. However, RAROC can be not informative about the return for capital providers in case if less risks are being taken than the capital position and credit rating allows. In this case the capital available should adjust to the economic capital either through increasing risk appetite or distribution capital available to shareholders (reducing the available capital), or redistribute and weigh the capital across business line according to risk appetite, which is more rational solution (De Weert, 2011: 171 f.). In case when the RAROC is higher than the Cost of Capital, the business line creates value. In order to adjust net earnings one should 1) deduct the risk-free earning on the positive difference between the available capital and economic capital; 2) adjust accounting profit and incorporate risk costs e.g. for mortality, morbidity, lapse; 3) to add back the goodwill amortization charges as it does not reflect the commercial performance; 4) consider one-time tax benefits or charges; or other items. On this spot one can deduct the process of creating value as economic profit

*EP = expected net earnings - CoC * Economic Capital*

This equation basically resembles the residual income model (excess income) adjusted to the economic capital rather than to the book value. Although, RAROC is giving the insight about the performance of business lines, it inherits the measurement drawback of the economic

capital as to severity of unexpected losses due to the fat-tails of loss distribution (compare, De Weert, 2011: 174 f).

From the investors point of view the stable and sufficient capital coverage (also solvency ratio) provides the stability of earnings and dividends of the insurer. On the other hand, the conservative balance sheet with the affluent capital coverage indicates on the inefficiency of the own funds use. For instance , when he overcapitalization takes place or the economic capital ratio over 200% is not distributed directly to shareholders. The structure considering the quality of capital should be considered. This is especially important to the non-life insurers as they hold different levels of reserve surplus which strength can be analyzed through the reserve adequacy.

ANAV (Adjusted Net Asset Value) has the highest quality of capital readily available for shareholders.

Debt capital is a high quality hard capital but repaid at some point.

Value in Force is not distributable capital, because it is allowance for the value of future profits to be released. The sub-debt is the second part of the hard capital (as ANAV). Reliance on the less qualified capital restricts the capital distribution capacities (Sinclair et a; 2014: 35).

Tangible equity(TE) = IFRS
– unrealized gains
- goodwill
+ including DAC
+ acquired in-force.

Tangible equity ratio (TER) = Total liability / TE

The higher tangible leverage ratio results in the higher volatility and higher costs of equity.

Considering the investment structure and the quality of assets is an important issue across the insurers that are striving for the higher Return on Investments. The failure of the stress test leas to the increase of the required regulatory capital. (ML report, 36)

Solvency regulation and capital calculation follows the Basel II own capital regulation for banks.[14] It based on three pillars: 1) market consistent valuation of assets and liabilities, identification and calculation of capital items, calculation of SCR and MSR; 2) Supervisory activities for insurance companies, regulation of risk and solvency positions assessment; 3) transparency and market discipline. Consider the balance sheet structure for Solvency purposes.

[14] See the Bank for International Settlements (BIS) website, https://www.bis.org/about/basel_process.htm?m=1%7C392

Table 12 the balance sheet structure for solvency purposes

<table>
<tr><td rowspan="5">Assets
(at fair value)</td><td colspan="2" rowspan="2">Market consistent value of liabilities /
Market value of technical provisions</td><td>Technical provisions at best estimate</td></tr>
<tr><td>Risk margin (for non-hedgeable risks)</td></tr>
<tr><td></td><td rowspan="3">Available capital</td><td>Excess funds (surplus)</td></tr>
<tr><td>SCR</td><td>Regulatory capital add-ons</td></tr>
<tr><td></td><td>Minimum capital requirements</td></tr>
</table>

Source: Massari, 2014: 182; De Weert, 2011: 97)

Asset resp. liabilities are valued at the arm's length principle replicating the free market situation at a given date without any adjustment to creditworthiness or reinsurance (Massari, 2014: 183). That means the following the IFRS / IAS contradicts to economic value. In order to establish the economic value the insurer should follow the mark-to-market approach with reliable prices. Otherwise the mark-to-model approach based on most affluent information base is applied. In most adverse case the IFRS principles can be omitted if it does not reflect the economic value of an item.

Applying the economic principle to the provisions, the cost replication principle is used. It means that costs to transfer the insurance and reinsurance obligations to a third party are taken as fair. The valuation should be market information consistent and calculated at the prudent and objective manner. It should also rely on the grouping of obligations at least by business lines.

Based on the European insurance regulatory directive article Nr. 77 under the best estimate of the technical provisions is understood *"the probability weighted average of future cash-flows, taking account of the time value of money (expected present value of future cash-flows), using the relevant risk-free interest rate term structure". "The risk margin shall be such as to ensure that the value of the technical provisions is equivalent to the amount that insurance and reinsurance undertakings would be expected to require in order to take over and meet the insurance and reinsurance obligations".* [15] The latter is the caution pillow in case the obligations are sold on the market and is understood as the costs of own funds (or costs if capital rate) for the SCR (Massari, 2014: 183).

Own funds are classified in three tiers based on 1) permanent availability for the loss-absorption on the going concern basis and in winding up, seniority or subordination, maturity, options to redeem. Tier 1 is the core capital and unconditionally available, Tier 2 capital is shorter and available upon several conditions, Tier 3 capital are deferred tax assets and other instruments with no requirements of permanent availability (compare Directive 77, Massari, 2014: 185-186). Additionally, the ancillary capital instruments can be called up to cover losses (compare also, De Weert, 2011: 59)

[15] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:335:0001:0155:en:PDF

Surplus capital (excess funds) is the capital in excess of regulatory capital requirements (SCR and add-ons). Regulatory capital add-ons coming from the supervisor's (Central Bank) assessment of risks of an insurer according to the Pillar 2 (De Weert, 2011: 98). Solvency Capital Ratio (SCR) defined as VaR of basic own funds over a year with CI of 99,5%.

$SCR = BSCR + Adj. + SCR_{Op}$

Where BSCR: Basic SCR for the basic classes of risk (market, counterparty default, life, non-life health underwriting, intangible asset risk) and calculated as

$$BSCR = \sqrt{\sum_{ij} Corr_{ij} * SCR_i * SCR_j} + SCR_{intang.}$$

Where:

$Corr_{ij}$ is the Correlation matrix between the risks i and j

Adj: Adjustment for the risk absorbing effect of technical provisions and deferred taxes

SCR_{Op} *:* SCR for the operational risk

Minimal Capital Requirements (MCR) is the lowest acceptable level of capital requirements. The linear function to calculate MSR (consisting of life and non-life or reinsurance obligations) should be calibrated "to the VaR of basic own funds (Tier 1) with CI 85% over one year. (Massari, 2014: 188).

$$MCR_{NL} = \sum_j \max(\alpha_j * TP_j ; \beta_j * P_j)$$

Where

TP_j *:* technical provisions (net of risk margin) for each business line, net of reinsurance

P_j *:* premiums written in each business line within the last 12 months net of reinsurance

α_j, β_j *:*calibration coefficients

The MCR_L *is completed with the Capital at Risk (CAR) component.*

Then $MCR_{combined} = \{\min[\max MCR_{linear}; 0{,}25\ (SCR)); 0{,}45\ (SCR)]\}$

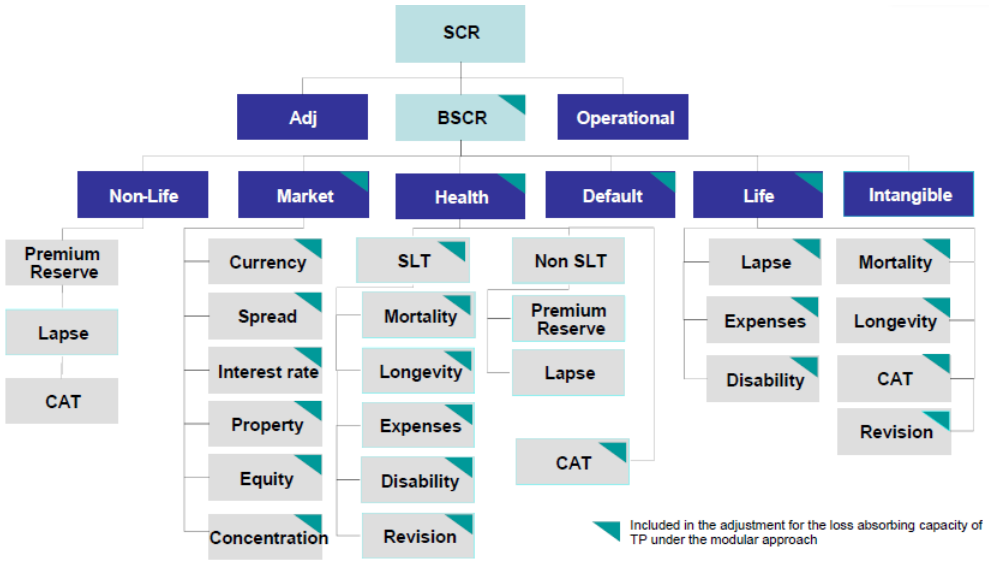
With the adjustment to the SCR dependent peg.

(Massari,2014: 190)

6.1.1. Risks underlying the Solvency II

Due to the fact, that the solvency capital requirements relate to the risk not only of liabilities but also of assets and even to the risk mitigation system the main risk factors and their potential severity for the balance sheet resp. earning should be analyzed.

Figure 5 The system of risk factors for the Solvency Capital Requirements calculation.



Source: Institute and Faculty of actuaries, www.actuaries.org.uk

Underwriting risk is defined as "the risk that the premiums collected will not be sufficient to cover the cost of coverage". The unprecise estimation or failed assumptions for the premium calculations are main source of that risk (Nissim, 2010: 44)

The fair price calculated as total expected costs for serving the policy (E [Claim] + E[Adm.costs] = fair price) can be misleading due to changes in regulation, *longevity, unpredictable catastrophes*, as well as new previously undisclosed risk factors for health. The exposure to the underwriting risk is especially critical during the competitive phases on markets and abnormal premiums charge decrease. While the non-life insurers are rather exposed to the natural catastrophes being not able to spread the risk due to high correlation, the life insurers suffer mostly form the demographic factors like longevity and mortality. They are forced to pay longer and exceeding single premium charges resp. to pay back benefits prematurely (ibid., 44)

Market risk is defined as

"potential economic losses arising from adverse changes in the fair value of financial instruments and other economic assets and liabilities due to changes in financial variables such as interest rates and stock prices" (ibid., 45).

For non-life insurers the most critical are the risk of the investment portfolio that is exposed to interest rate risk, prepayment risk, credit risk, liquidity risk, equity price risk. Due to the long tail of policies and the decisive role of liabilities the life insurance have additionally asset-liability matching problem.

Interest rate risk comes primarily from the valuation of fixed income financial instruments. Besides, the changes in interest rates often affect or are correlated with changes in other determinants of fair value what make the problem more complex e.g. creditworthiness of issuers,

credit spreads and, the value of prepayment options (ebd., 45). Prepayment and extensions risk are the opposite potential reactions of the borrower to the interest rate change that alters the fair value of securities. The borrower either repays the debt or extends it. This is more probable with the instruments without additional penalties. The default risk arises from the borrower potential default or the change in the credit spread due to the rating changes. Liquidity risk is related to the insufficient market to sell the securities or to meet obligations as they arise in an unpredictable pattern. Equity price risk relates to the changes in the equity instruments or stock prices. The life insurers due to the inclusion into portfolio of these instruments are exposed more significantly than the non -life insurers. Although this exposure is often not material. The fluctuation of the assets under management (AUM) due to the equity prices changes can lead to the insignificant fee changes (ibid., 46). The instability of long tail policies may expose an insurer to the downgrade or rating risk . The main factor is the capital adequacy (quality of own funds). This in turn forces insurers to restrict the own and to reconsider their underwriting strategies. Also all types of risk play a complex role in establishing the rating (ibid., 46 f.).

The group of regulatory risk factors are of smaller importance for the calculation of Solvency capital requirements. They however may expose operation to significant changes and lead to the interruptions in the business model. For instance, the insurance business may become more regulated with limits for premiums, force insurers to write polices for socially vibrant problems, or increase the part of premiums ceded to reinsurance, regulate the dividend allocation (ibid., 47 f., De Weert, 2011: 102 -105).

The risk management strategies can mitigate the above mentioned risk factors and reduce the respective exposure. Indirectly the results are more persistent earnings and balance sheet stability. It is primarily aimed at evaluation and statistical measurement of value at risk and calculation of the economic capital needed for the regulatory and underwriting purposes. Economic capital is roadly defined here as the “amount of capital to absorb potential losses which may occur at a given confidence interval and time horizon” (bid., 49). Despite the drawbacks related to the underestimation of fat-tail risk severity and skewness Value-at-Risk method (VaR) remains the most widespread method to measure the net fair value exposure from complex risk factors.

7. Costs of equity

For insurance companies the cost of capital or the cost of equity or is an important driver that depends on many factors coming not only from the leverage, but also from the riskiness of liabilities and assets in combination. It is not trivial task to calculate the costs of equity for the balance sheet and earnings that has heterogenous maturity structure. The future cash flow should be discounted coherent with the level of risk born by those flows. For the valuation of financial companies the relevant streams should be chosen: dividends in the dividend discount model,

cash flow to equity in the discounted cash flow model, or excess return in the excess return model (or residual income model). Although, the cost of equity calculation is identical for all three models.

The capital asset pricing model (CAPM) is the most widespread method to estimate the cost of equity. Nissim (2010) formulates the CoE in more general manner as "the rate of return required by its equity investors given the expected duration and risk of equity flows (dividends, share repurchases, or other distributions)" (Nissim, 2010: 138).

Among the techniques to estimate the riskiness of the stock are:

- Joint distribution analysis of stock returns and market wide risk factors, or the return on the proxy of the market portfolio and return on factor mimicking portfolios.
- Mapping fundamental risk factors (e.g., leverage, size, value ratios, industry exposures) into an estimate of costs of equity. This model extract information on pricing of these fundamentals from historical beta
- Reverse-engineering the CoE from market prices and earnings or cash flow forecasts (see additionally Nissim, 2010b; Nissim 2013)

Return-based Proxies for the Cost of Equity Capital is also known as capital asset pricing model (CAPM). Formally, the CAPM is expressed as:

$$r_e = r_f + \beta * (r_m - r_f)$$

Where

r_e *: return on equity*
r_m*: market return*
r_f*: risk-free return*
β *: covariance between the market premium and the return on equity aka the sensitivity of individual stock to the systematic market risk (compare also Massari, (2014: 108);*

Practically, the following algorithm should be used for beta estimation 1) consider the horizon adjusted to structural changes (risk capital), 2) frequency of return check, 3) referral market index. Although, firms of the same size, geography and segment should be considered in the peer group. (Look the beta evolution across segments). It is reasonable to use in some cases the industrial beta to capture more thoroughly actual risk in the segment (Massari: 2014: 109).

The use of adjusted beta β_{adj} is reasoned due to the trend of growing companies to reflect more risk and more mature companies to tend to the $\beta \approx 1$. So weighing the risky observed beta with 0,67% and beta tending to one with β_1= 0, 33 (Massari, 2014: 110; Blume, 1975)

In the USA the risk free is approximated with the ten-year Treasury yield or any high rate government bonds. For the German and Austrian market, the German Bund interest rate curve form the benchmark for the risk-free rate. Additionally, the country specific margin should be added. It is a widespread practice, that companies publish in their financial reports the methods of costs of equity estimation including the risk-free rate benchmark. The beta estimated can be used with some attention for the estimation of the costs of equity of all segments despite the different riskiness embedded on the economic capital calculation.

The risk is decomposed into systematic or market risk and idiosyncratic or individual stock risk. The market rewards only the market risk with the market risk premium (MRP). *The risk premium of the company is usually calculated as the market risk premium multiplied with the beta coefficient derived from the regression of the difference of the equity return on the MRP given the normal distribution of the equity return obtained from the historical data of the company. For the market return S&P 500, Eurostox or other regional stock indexes are considered to be enough balanced. Alternatively, beta is approximated from the peer list. In case of financial companies it should not be unlevered (compare Massari, 2014: 108 f.)*.

The normal distribution assumption introduces the link between the mean and variance of stock returns (see Sharpe, 1964). That means that riskiness is expressed solely through variance omitting the higher level moments i.e. skewness and kurtosis. The latter is especially important due to the occurrence of fat tails and severity of unexpected losses in the confidence interval (Nissin, 2010: 138).

The CAPM has been extending since its invention through additional coefficient e.g. unexpected inflation, instant changes in interest rates and returns on factor mimicking portfolio estimating betas of each factor and a risk premium associated to each factor (Fama&French (1992), Carhart (1997). Size and book-to-market factors are the primary ones[16]. However, the specifics of insurance companies (liability based business) may cause deviation in applying CAPM. Additionally, life and non-life segments' exposures differs due to the duration of portfolios and execution of policies (claims). In life segment the availability of options and guarantees can cause non-linear relationship between benefits and market returns (Nissim, 2010a:.139)

CoE can be also estimated through the ratios and other fundamentals which capture various risk factors. By so called mapping or regression the costs of equity on the fundamental factors resp. ratios. The set of historical betas of the peer group is used to derive the weighed average beta or adjusted beta. In case of levered beta, it should be unlevered and the re-levered (ibid., 139 f.). Using additional factors beyond leverage in obtaining predicted beta. This method based on the regression of previously obtained historical betas for the peer group (with the sufficiently long historical information) on he set of risk factors (size, leverage, earnings variability). Then the coefficients are used to calculate the predicted beta for each company using

[16] French, K. He official website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (retrieved on 1.9.2018)

the current or expected data on mentioned risk factors. Thereafter the median or mean is calculated (ibid.,140). Often the adjusted beta is used to consider the mean reversion trend in the data distribution.

> *Financial Leverage is defined as* "the relative magnitude of debt compared to equity financing" (ibid., 140).

The equity holders absorb the effect of additional financial leverage in the form of volatility of return on equity. This implies premium to return due to the systematic, idiosyncratic and solvency risk. Additionally, higher indebted firms are limited even in borrowing new debt. In case of urgent debt issuing they borrow on higher rates and are more sensitive to interest rates, credit spreads, and liquid funds. The high leverage can lead to the business risk, as the reputation can be worsened in the eyes of customers. Consider also the regulatory capital (ibid., 140). The size of a company can be used as a proxy for the risk and CoE. Empirically, larger firms are diversified, have more capacities for hedging risks, financially more flexible, more stable profits, and growth rates. The larger firms have also some operational advantages like bigger market size, bargaining power, economies of scale and scope (ibid., 141).

Insurance companies have specific fundamental to capture risk while calculating the cost of capital. It is linked to the calculation of the regulatory and the economic capital which has been discussed above. These risk factor are load the discount rate with the premium for the investments in risky assets. Additionally, liability flows consisting from not earned premiums characterized by risk factors like volatility, high growth, high combine ratio, the long tail, reinsurance assets quality and volume can negatively impact the value through the additional risk premium load (ibid., 141).

Price-Implied Cost of Equity is backward engineering of equity costs of capital referring to the market prices and comparing to the CAPM to assess the risk premium (ibid., 142). Nissim (2010b), Nissim (2013b) suggests that the implied equity costs of capital are higher in the crisis time (as it used to be in the 2008 – 09). This increased risk premium correlated with firm specific risk factors like market beta, idiosyncratic volatility, book to market ratio however negatively related to size, co-skewness, and equity to asset ratio. The risk premium was in the meaning of the author the good predictor for the equity price. Given the information on the prices and the expected flows Nissim (2010b) inverted the formula and calculated the implied costs of equity capital (ICEC). The idea of the ICEC is to gain insight how to compare risk and expected returns. The ICEC can be used also for the risk premium calculation.

8. Forecasting

The importance of growth factors across balance sheet times has been emphasize above. In this chapter the main focus is on the forecasting techniques and principles applied to the valuation of financial companies. Similar to the non-financial companies the forecasting is

applicable to the nearest time forward looking horizon of about five years given the data availability. One can differentiate into growth and no growth forecasting with the differing of the latter into the extraordinary and normal growth phases. Establishing a value of the company one should rely on the business model stability and apply the principles of:

- Status quo analysis and adjustments of balance sheet to the one-off item especially in the categories of asset valuation, reserve adequacy, solvency.
- Check internal consistency of the business projection, i.e. coherence with the historical data development both asset and liability side and the financial and operating forecast.
- Checking external consistency, than means to assessment of the impact of external factors such as macroeconomic factors, interest rates (Massari, 2014: 193).

Status quo analysis includes the check of asset valuation principles and possible write downs, reserve adequacy or the check of availability of Tier 1 , 2, 3 capital and their shares in total own funds, and the solvency framework resp. economic capital modelling Massari, 2014: 195).

Internal consistency serves the purpose of the justification of the forecasted numbers and is based on four principles: consistency between historical and forecasted data, between balance sheet and income statement data, asset and liability sides, financial and operating forecast.

Data consistency should be aimed at the trend investigation and trend coherence unless the extraordinary items do not happen. It is either possible through the percentage expression of balance sheet and income statement items in relation to the base (revenue, total assets, premiums earned, common equity). The focus is given at costs (COR), resp. assets mix (Masari, 2014: 196). The key drivers' evolution discussed in the previous chapters is another useful method to assess the internal consistency. They should be repeated: premium growth (and it factors), retention ratio (proxy indicator for asset riskiness), combined ratio (proxy for costs in the non-life sector), investment return (especially important for life business), reserve ratio (share of reserved at the regulator liabilities in form if high liquid assets), solvency ratio, payout ratio, ROE, new business value margin (i.e. profitability of the new business written the last year), Return on Embedded Value (ROEV). These ratios should be check on consistency with the management actions announces and other macroeconomic changes. In case of any deviations the corrections should be done (ibid., 197)

The balance sheet and incomes statement consistency should provide the coherence with the insurance business model (see above). In particular, the written premiums are reflected in the liability side and transformed into investments in the asset side but cause costs reflected in the income statement; the investment income insures costs; provisions for future claims are periodically released or strengthen through the income statement, the difference between future estimated and actual claims is reflected in the income statement leading to adjustments on the claims liability side. Thus the development of premiums and claims goes in line with reserves, and investment income with asset allocation (Massari, 2014: 197).

Peculiar to the reserves (non-life) is that they are often not discounted i.e. expressed in the balance sheet in nominal values. The ratio of net technical reserves to net written premiums is an indicator to assess the consistency. Additionally, the retention ratio or reinsurance assets to gross technical reserves. The investment income should be consistent with the risk profile of the asset mix.

Checking the sustainability of the company's balance sheet one should pay attention on duration or cash matching principles of assets and liabilities. The difference in liquidity and duration of assets between life and non-life business segments, as well as between the short and long tail (difference between event occurrence and claim settlement) can be significant. The assets are mixed accordingly to the tail horizon: liquid assets of the short time and equity assets for the longer tails).

In the financial and operating forecast the attention should be paid on distribution and product mix. The former relates to distribution channels and include sales force, agents, brokers, bank assurance, direct sales. These channels have their efficiency and can affect the underwriting profit. The product mix (related to policies object i.e. automotive, real estate etc) are the central element of profitability. They are also concerned with the frequency of premiums (single, recurring, regular), profit participation, individual or collective (Massari, 2014; 200).

The external consistency should prove that the business plan is appropriately related to macroeconomic factors and competitive environment or set benchmark. There is significant difference between the life and non-life segment in assessing the influence of macroeconomic factors. Life insurers are highly sensitive to the interest rate environment and suffer under the current negative interest rate environment.

Firstly, the life segment depends on the economic cycle due to the mostly voluntary nature of annuities and private motivation. Secondly, downs and ups on the asset markets (provide studies on the correlation) influence the income volume and motivation of depositor to save money with insurers. Beyond all change of regulation especially differences across regions and countries can impact the competitive position of the insurers and affect the value through the income generation and underwriting capacity (Massari, 2014: 201).

Non-life companies have another profile. The car and real estate insurance are compulsory at least at the basic level. This fact makes the non-life segment quite immunized against macroeconomic outlook, unless the volume of car and real estate market does not shrink. Although, if claims are inflation tied they can increase in nominal values too. This can be overridden through the soft market dynamic with the premium price pressure. Due to the short time horizon of policies, non-life insurance companies can easier adapt to the market and pricing cycle through the underwriting aggressive policies or focus on profits. Assessment of competitive dynamics can be very subjective but relies on some proven methodology such as SWOT and Porter's 5 Forces. Herewith the internal strengths and weaknesses are to note first. Normally, a company assesses risk and dynamic of the industry in the attachment to the financial and yearly

reports. Quantitatively the benchmark comparison and the market consensus check is the most productive way to compare the competitive advantage (see also Massari, 2014: 202 f.). Practically the dynamics of macroeconomic factors can be forecasted in scenarios weighted by probabilities of predictable occurrence.

*Focusing on forecasting aspects i*t is essential to elaborate the algorithm to build a sustainable model.

Underwriting profit = premiums – expenses - claims

Investment profit = net investment return / total investments =

(investments return-investment expenses) / (sum of reserves + shareholder's funds)

Retained earnings = earrings – payout dividends

$Equity_t = Equity_{t-1} + Change\ in\ Equity\ (Net\ Earnings)_t$

The non-life business starts with the equation

Gross Premiums Written (GPW) = volume pricing*

They can be estimated either by calculation the market share of the company or to project the accounting results The former is a combination of the GDP growth, inflation and penetration ratio, which is higher in developed economies and faster growing in developing economies. If the company is pursuing the aggressive pricing policy should lead to the increased share but not the revenue. The estimate of the evolution of the pay-out ratio should be consistent with the smoothing policy, capital management (reinsurance as alternative to capital relief) (ibid., 204) NPE can be estimated on the retention ratio or ratio of NPE to NPW. The estimation of net claims is driven by expected claims frequency and severity additionally incurred but not reported and should be consistent with the pricing cycle. Net expense incurred is a sum of acquisition expenses, commissions paid to distributors, administration or cost of personnel, claims handling or cost of settling claims (Massari, 2014: 205). Herewith the suggested method is to deduct all expense as ratios from NPE. However, the more important is to follow the logic of the underwriting cycle or pricing cycle while determining the combined ratio. This way it should be externally consistent. Soft market policy affects also the claim and expenses ratio after the aggressive marketing (compare Massari, 2014: 205). Depending on premium growth insurance reserves' development can be forecast as the stable ratio of GPW or NPW. Alternatively, one cam model unearned premiums reserve and claim revere following the earn-out pattern of GPW or NPW resp. claims pay-out pattern. Forecasting net income one assess the net reserves and shareholders' funds as total investment basis (both on the average or opening balance) assuming the stable investment strategy of the company regarding the risk appetite and the constant asset liability strategy. Then , the ratio of investment return to this basis is computed. Taxes on income can be computed as effective taxes and as the assumed one based on the deferred -taxes volume

in previous years. And last the pay-out ratio is assumed based on the dividend policy of the company and solvency capital retention (Massari, 2014: 206).

In *case of life segment business* the underwriting profit is modeled similarly. However, life policy premiums can be singular (as a lump sum deposit) or regular (monthly payment for pension plans). This combination introduces the annual premium equivalent (APE) as a one tenth (arbitrarily assumed) of single premium written within a year and full regular premiums. Additionally, the present value of future premiums is added up. As has been discussed the underwriting risk play a significant role in the underwriting profit of the life segment, e.g. surrender and mortality changes.

Commission and management fees are a significant income for some insurers especially with high share of unit-linked assets. The fees evolution can be assessed depending on the equity price dynamics and the management costs of AUM. Additionally, the performance fees can be also included. Claims expected and actual depend on the actuarial assumptions of mortality rates and -de-facto mortality. Surrender penalties are considered also in claim ratio. On the other hand, the guarantee benefit (as a form of the put option) is written in contracts in case of surrender (ibid., 207).

Technical provisions or reserves calculated as present value of future depend positively on premiums written and return and negatively on benefits and related costs and surrenders.

Consequently, the investment result similar to the non-life segment depends on the total investment based on reserves and extension of guarantees. Especially in the last years, the guarantees are the object of analysis due to the widespread practice to attract customers.

Embedded value (EV) profits are the sum of value of new business or PV of future cash flow sold in the current year, profits generated und realized and unwind of in-force business, investment return on the retained surplus capital (ibid., 208).

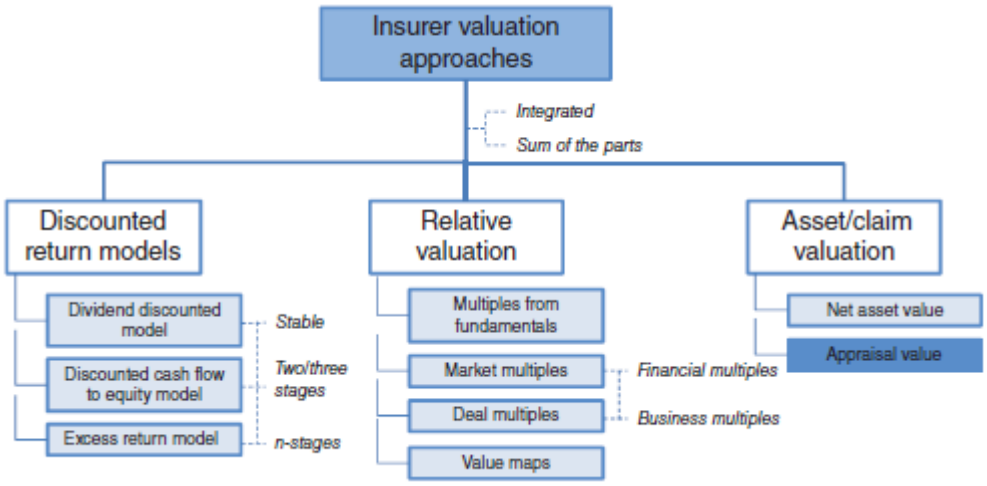
9. Valuation models

In the following part the models used of the valuation of insurance companies resp. segments will be presented formally and discussed abstractly with consideration of the drivers, economic profit, and value creating aspects.

In comparison to non-financial firms the valuation of banks and insurance companies is on the one hand easier. It is equity based, due to the significant financial leverage that is used to fund operating assets to generate income. Thus, the enterprise type valuation with the EBIT or EBIDTA base can fail in determining the fair value. On the other hand, the riskiness of assets and the Basel II, Basel III and Solvency II capital requirements make it more complicated because the equity and liability on the balance sheet can be and should be adjusted for the operation assets or investments risks. Herewith the discussed problems of cash flow determination, the costs of equity can lead to the variations of the discounted value of cash flows.

The valuation models discussed in first paragraphs of this thesis can be roughly grouped in fundamental valuation, appraisal value or embedded value model, and relative valuation.

Figure 6 The map of valuation approaches



Source: Massari, 2014: 210

Considering the difference of income composition and the time horizon of cash flows coming from the reserves, as well as several accounting aspects discussed above the life and non-life segments need different approaches in valuation.

However, the insurance companies are not specialized in a single segment often. Thus, different approaches should be combined in the sum-of the-parts method with application of appropriate valuation models to each segment. Additionally, the relative valuation despite all limits that arise applying it is the widespread and productive method. It should be noted that the estimation of the fair value does not equal the selling price. In the merger or acquisition deal the value is at the end the object of negotiation due to the different assumptions and market considerations used in models. Thus, differentiated look using the football field method can be applied as a reference or starting point for these negotiations. This is roughly the comparison of diverse models considering the underlying scenario and averaging the value resulting from all models. The map of valuation approaches can be briefly depicted

9.1. Life segment valuation

The problem of the life segment valuation is the riskiness of reserves due to the long time horizon and special contract features. It forces to assess qualitatively and quantitatively the additional information. For instance, level of guarantees, asset-liability matching, profit participation, DAC amortization are the factors that can contribute to estimation errors. Important is to analyze the contract type and combination of the liability portfolio: term contracts and saving products etc.

9.1.1. Appraisal Value / Embedded Value Approach

Appraisal Value (AV) is defined as

AV = Adjusted Net Asset Value (ANAV)

+ Value-in-Force-Business (VIF)

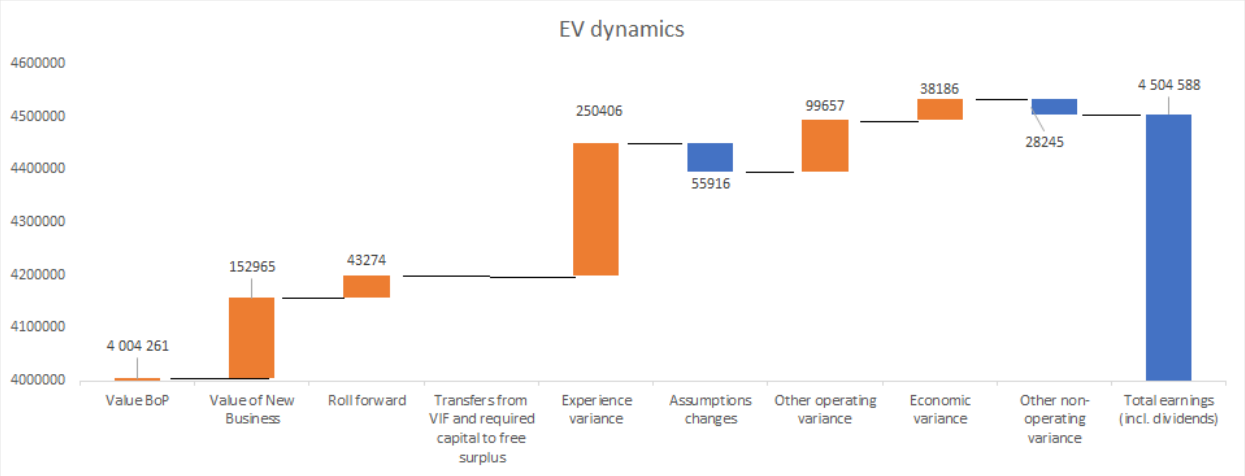
+ Value of Future New Business

Where

Adjusted Net Asset Value (ANAV) + Value-in-Force-Business (VIF) = Embedded Value (EV).

The reporting of the embedded value considers all cash-flows to it during the year. Exemplified as the waterfall diagram as an example of VIG EV flows.

Figure 7 Embedded Value Dynamics VIG



Source: Vienna Insurance Group, www.vig.com, VIG Embedded Value Report 2017

The driver for the EV are the cash flow from the in-force business at the beginning of the period, unwind of the risk discount rate resulting from the revision of actuarial assumptions and consequently the prudential risk premia, return in the companies free surplus. Additional driver is the new business which undergoes quite subjective estimation and results in large volatilities of EV growth across time horizon and differences across peers. The EV is a special procedure because it as it has as earning driver the return on free surplus which links this method on the risk profile and Solvency II risk capital calculation. Also, the allocation of the embedded value foresees the dividend payments (Sinclair et al, 2014: 29). The EV is regularly estimated and disclosed by insurance companies. The organization codifying EV is the CFO forum[17]. The most actual releases with adaptations are the European Embedded Value (EEV) (2004) and Market Consistent Embedded Value (MCEV) (2008). It is defined as

[17] http://www.cfoforum.nl

"the present value of shareholders' interests in the earnings distributable from assets allocated to the covered business after sufficient allowance for the aggregate risks in the covered business. The allowance for risk should be calibrated to match the market price for risk where reliably observable". (CFO Forum, 2016: 3)

According to (Nissim, 2010) the cash flow projections used in the VIF calculation are measured at discretion. The broad list of general and specific assumptions allows the space for manipulations. The time gap of the EV disclosing and valuation timepoint can differ (Nissim, 2010: 147). The most important drivers of VIF should be discussed in detail.

$$VIFt = PVFPt - COTSt$$

Present Value of Future Profits ($PVFP_t$) (income profits- IP) at the time point t, i.e. projected stream of future after tax profits expected to be generated by policies in-force (in book) or the difference of earnings on in-force business and the capital required to support it. The in-force portfolio is closed, what means it consists of contracts at the timepoint of valuation without adding any new policies in the future. (Sinclair et al, 2014: 29; Massari, 2014: 2010).

$$PVFP_t = \sum_{i=t+1}^{n} \frac{IP_i}{(1 + k_e)^i}$$

Where

IP is the income profit at timepoint I

k_e *: costs of equity*

n is the longest maturity contract's timepoint

Cost of Target Solvency Capital ($COTS_t$) (also defined as Frictional Costs of Required Capital) are implicit financial costs related to the closed portfolio resulting from the difference from expected equity return and yield form investments into low risk assets (due to the regulatory reasons). It can be interpreted as opportunity costs of the regulatory capital or losses due to the low return investments.

Formally:

$$COTS_t = \sum_{i=t+1}^{n} \frac{M_{i-1} * (k_e - i)}{(1 + k)^i}$$

Where

M_{i-1} : capital allocate into the existing business portfolio to meet the solvency capital requirements (Massari, 2014: 211).

The income profit is the best estimate based on actuarial assumptions and scenario analysis. The main assumptions are mortality, evolution of operating expenses and tax expenses,

expected investment result, contract churn-out rate, impact of reinsurance activities and DAC amortization policy[18].

Due to the fact that the VIF is a closed portfolio its value decreases over time with the expiration or termination of contracts and releases the solvency capital needed. Thus, the opportunity costs decrease too. It leads to the notion of the adjusted through the allocated capital VIF. Here the allocated capital is the exact amount for the regulatory purposes whereas surplus capital is higher than the excess capital for the "valuation purposes" (Massari, 2014: 211). Because of the complexity of the VIF calculation the most optimal way is to relay on the target company releases.

ANAV = Required Capital (Shareholders Assets assigned to life business over required to pay anticipated liabilities)

+ Free Surplus (unencumbered shareholder assets over required to support life business and required capital)

Adjusted Net Asset Value otherwise defined the own funds with consideration of the economic principles. In the principle 4 by CFO Forum free surplus is defined as

"the market value of any assets allocated to, but not required to support, the in-force covered business at the valuation date. Free surplus is determined as the market value of any excess of all assets attributed to the covered business but not backing liabilities over the required capital to support the covered business". (CFO Forum, 2016: 3)

Additional cash flow elements of the VIF are Cost of Residual Non-Hedgeable Risk (CRNHR) and Time Value of Financial Options and Guarantees (TVFOG).

Focusing on the later term there are problems due to the long duration liabilities to customers within the saving product contracts. This causes the asymmetry of the life insurance business comes from the profit participation of clients in the investment return. It depends both on the guaranteed profit and the current investment yield, as well as on the profit participation share. There is no closed formula available in the valuation of the options and guarantees in the life contracts. With the profit participation of shareholders of 10%

the company profit $= 100\ \% * (E(r) - G(r)) * (1-p_p) = i_p$[19]

Where:

E(r) : is the expected investment yield

G(r): the guaranteed yield

p_p: policyholder participation rate

i_p: insurer nominal yield

Numerically: $i_p = 100 * (7\% - 2\%) * (1 - 0,9) = 0,5\%$

[18] Churn-out rate is the rate of contracts unsubscription.

[19] www.uniqa.com

The availability of options and guarantees make the calculation of VIF more complicated and require the profit and loss simulation using the Monte Carlo techniques. In this case, the discounting capital market model (as has been discussed in the scientific part) should be risk neutral and market consistent reflecting the actual conditions.

As such the VIF under the stochastic scenarios can be also rewritten as:

$$VIF_0 = \frac{1}{N}\sum_{t=1}^{M}\sum_{j=1}^{N} profit_t(j) * d_t(j) = E\left[\sum_{j=1}^{M} profit_t * d_t\right]$$

Where

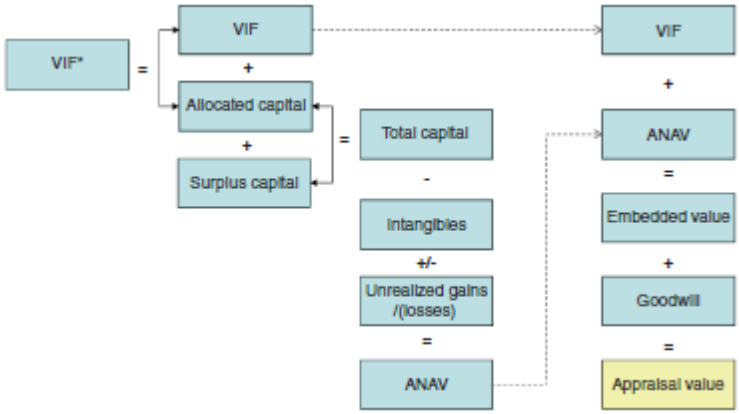
M: the number of years of discounting

N: the number of market consistent scenarios

d_t*: risk neutral discount factor*

$profit_t(j)$ *: profit or loss simulated in a single scenario*

Figure 8 VIF and appraisal value calculation framework



After Massari, 2014: 212

The concept of Adjusted Net Asset Value (ANAV) is based on the Net Asset Value (NAV) which is equal to the difference of the market value of total assets and debt and claims. It equals to

ANAV = book value (IFRS) shareholder's equity (= statutory capital + surplus + asset valuation reserves),

+ /- adding the unrealized gains / losses on assets without current market values

-Value of intangibles (goodwill, DAC) and

+/ - adjustment for IFRS values and subtraction of intangibles (Massari, 2014: 128, 212).

Based on the EV or MCEV the Group Embedded Value (GEV) is calculated as the sum of the MCEV and the IFRS based non-life segment value (based on the cash flow earnings) without consideration of economic costs. Formally

GEV = (MC)EV + IFRS NAV

Additionally, the part of the AV is the *business goodwill or the franchise value.* It is based on the assumption that the insurance business policies' sales are expected to grow related to the existing and new business. It is the highly speculative item that can inflate the firm's value. The qualification and opinion of external valuator play the focal in estimation of market share, potential, distribution network, segmentation, product mix etc. (ibid., 213 f.). The new business is defined by CFO as

> "that arising from the sale of new contracts and in some cases increases to existing contracts during the reporting period. The value of new business should reflect the additional value to shareholders created through the activity of writing new business." (CFO Forum, 2016: 7).

Similar to the VIF the value of new business equals value to the profit after taxes net of discounted financial options and guarantees, frictional costs of capital, costs of non-hedgeable risk and minority interest. (ibid., 7)

Technically it based either on DCF model or on the multiple. The DCF model is regarded to be the most exact given the information for the explicit forecasting period for the new policies sales. However, the relative valuation (multiples) is adopted. For the valuation of the Goodwill the same approach as for the total company is adopted. One chooses a driver, i.e. Net Business Value (NBV) that is disclosed by companies. That is the present value of future profits after taxes less the capital requirement costs from the new contracts sold in the current year (see also EOPIA).

Formally

*Goodwill = m * NBV*

Where

m: multiple that is calculated form the sample of companies through the reverse engineering, given the information on Goodwill and the NBV.

Goodwill (GW) can be assessed as the difference of the market capitalization or the price and the embedded value (EV). All indicators NBV, Price, EV are disclosed, so the information on the sample of companies can be collected. Formally:

$$m = \frac{P_n - RV_n}{NBV_n}$$

Where

n: a company observed on the market.

Alternatively one can assess the competitive advantage of the company for the last 3- 7 years. (ibid., 214). Massari (2014) considers hat Excess Return Model should be identical to the Appraisal Value model in terms profit segmentation into the current invested capital (ANAV) and to be added in the future (ibid., 215).

The CFO Forum systemizes and codifies assumptions in the MCEV disclosure. The assumptions should consider historical data and experience, current trends and expected dynamics. Each firm should prepare and regularly review the list of assumptions specific for its business model (CFO Forum, 2016: 9). The most critical assumptions are demographic (mortality, morbidity, renewals and future levels of withdrawals of in-force business), expenses (allowing for the business support and inflation), taxation, legislation The group of economic assumptions obey the internal consistency principle and consider inflation based on the available market instruments, do not allow for asset values smoothing in comparison to the current market, follow external consistency of discount rates to the market, reference risk free rates considering term and liquidity of the security. Additionally, the stochastic model and volatility assumptions should be consistent internally and based on the recent market data (CFO Forum, 2016: 11 ff.).

9.2. Fundamental Valuation Models

The insurance firms possess the folowing unique characteristics that allow the equity based vauation:

- Insurers is a liability driven business. The insurers, especcially with long run liabilities (life segment) have the high leverage ratio and earn mostly from NII. Operation assets are extreemely low in comparison to the non-financial firms;
- The book values of assets and liabilities are close to the fair market value due the frequent repricing. The balance sheet can be a sufficient approximation for determining the value
- The abiity to write premiums is directly reated to their surplus (regulatory equivalent for the equity capital). The minimum equity capital appropriate for the riskiness of activities (actives). The level of the reguatory capital is a useful metrics for the estimation of riskiness and scale of operations.

Free Cash Flow to firm method used to value of non-financial companies is not applicable in valuation of financial companies due to the discussed above differences. The appropriate models to value financial companies are: (a) Dividend Discount Model (DDM), (b) discounted net equity flows or discounted cash flow to equity (DCF), (c) the residual income or excess return model (RIM). They drivers, advantages and disadvantages for the insurance companies' valuations are disused below.

9.2.1. Dividend Discount Model (DDM)

DDM is the simplest model given the projection of dividends resp. dividend policy knowledge. However, from the value creation point of view it is not sufficient informative (Nissim, 2010: 148). There is no difference in application of DDM to financial or non-financial companies. Thus, the dividend smoothing hypothesis can help to forecast dividend flows given the sufficient historical data (Lintner, 1956). Basically, the pay-out and the growth should be factored into the DDM valuation model. Thus, DDM model requires the in-depth growth analysis and assumptions of dividends pay-out capacity use.

$$P_0 = \frac{DPS_1}{k_e - g_s} = \frac{DPS_0 * (1+g_s)}{k_e - g_s} = \frac{EPS_1 * p_s * (1+g_s)}{k_e - g_s}$$

Where:

DPS *: dividend per share*

EPS *: earning per share*

0,1,2 … - periods of time

k_e *: cost of equity*

g_s *: growth in the stable phase*

p_s *: pay-out ratio in the stable phase*

The DDM Gordon Growth Model assumes the stable growth rate. However, growth rates are practically often decline. It is assumed, that growth rates can decline linearly in stages. Considering the two stages of growths an additional explicit forecasting period with the extraordinary growth should be added. (Massari, 2014: 118)

$$P_0 = \sum_{t=1}^{n} \frac{DPS_0 * (1+g_x)^t}{(1+k_e)^t} + \frac{DPS_0 * (1+g_x)^n * (1+g_s)}{(k_e - g_s) * (1+k_e)^n}$$

Where additionally g_x: growth rate in the extraordinary growth stage

The model with the extraordinary growth is preferred in cases with clear indicators on the outperformance of a firm in relation to the whole economy. The growth rate forecast is normally given by national governments, financial regulators, estimated by international organizations. The risk-free rate can be used as a proxy for the national growth. In the most complicated cases with the unstable dividends all dividends cash flow from the explicit forecasting period should be projected.

$$P_0 = \sum_{t=1}^{n} \frac{DPS_t}{(1+k_e)^t} + + \frac{DPS_n * (1+g_s)}{(k_e - g_s) * (1+k_e)^n}$$

Generally, dividend pay-put ratio observed in the current period and forecasted should be consistent with the historical data on the firm, or in the whole industry. Otherwise the normalization should be done (Massari, 2014: 112 f.). The dividend yield can be used as a benchmark to use it in the DDM. The dividend capacity for the non-life insurance companies should be calculated using the minimal regulatory requirements (16% of NPE or 26% of claims) such as

$$Capacity = Shareholders\ equity\ (end\ of\ period) - Total\ required\ capitalDiv$$

Where

$$\text{Total required capital} = \max\{0{,}16 * NPE; 0{,}26 * claims) + 0{,}10 * APE + capital\ buffer$$

While capital buffer is usually defined as 100 % of the adjusted minimum capital or the sum of minimum capital requirement and minimum requirement on APE (usually 10% taken fix for the explicit forecasting period). The dividend capacity is then calculated in chains for each year of the forecasting period. If there is no information on current dividends but the indication to pay dividends in future, the modelling of dividends can be done assuming the pay-out ratio in the forecasting period based on company releases and implicit calculation.

$$g = (1 - p) * ROE$$

So that $p = \frac{ROE - g}{ROE}$ what indicates on the pay-out ratio as the residual percentage depending on forecasted growth of a firm (negative interdependence). Considering the

$$ROE_t = Net\ Income\ _t / \text{BV}_{t-1}$$

with the data on growth and net income the payout ratio could be calculated for the forested period. Additionally, the solvency capital should be calculated for the insurance companies. The excess capital should be added to the DDM results such as

$$EqV_0 = Excess\ (deficit) Capital + DDM\ Value$$

It does not affect the company's operations in the future but increase dividends. Although, the analytical approach to forecast implicit dividends assumes only the ability can be quite erratic and lead to the misinterpretations. In this case, the FCF to equity approach brings more transparent results (Massari; 2014; 113 f.)

9.2.2. Free Cash Flow to Equity Model

The Free Cash Flow to Equity in financial companies differs from non-financial due to the fact that investment activities are difficult to separate from comprehensive income. Thus, net income can be assumed as the proxy of for free cash flow available to shareholders with some adjustments. However, the net income cannot be freely distributed to shareholders before regulatory capital check and adjustment. The change of the risk profile of the insurance company can release or afford additional solvency capital. Thus, form the shareholders point of view the accountable investments should be made on the prudential basis into regulatory capital. Formally:

$FCFE_t$ = Net $Income_t$ +/- Equity (Des)Investment in Regulatory $Capital_t$ ($EIRC_t$) +/- Planned Change in Equity $Capital_t$

Where:

$EIRC_t$: the difference of the total regulatory capital held at t-1 and to be held in t at the Basis of Tier 1 capital ratio according to the risk profile. The negative sign means the deterioration of the risk profile and increase of the regulatory capital. It is usually calculated as the economic capital or as the Solvency II basis adding market consistent buffer.

Planned Change in Equity Capital: capital infusion or release (Massari, 2014: 119)

Similarly of the DDM model, DCF model can develop in two stages with the extraordinary growth phase and normal growth phase in the explicit forecast period and terminal phase. Additionally, FCFE and growth parameters can be estimated on the year-by-year basis. These models are identical in case of $FCFE_t = Div_t$

Applying the first stage

$$EqV_0 = \frac{FCFE_1}{k_e - g_s}$$

Where

EqV_0: Equity Value at the time point of valuation

$FCFE_1$: Free Cash Flow to Equity in the subsequent period assuming its stability

Two stages model

$$EqV_0 = \sum_{t=1}^{n} \frac{FCFE_0 * (1+g_x)^t}{(1+k_e)^t} + \frac{FCFE_0 * (1+g_x)^n * (1+g_s)}{(k_e - g_s) * (1+k_e)^n}$$

Year by Year

$$EqV_0 = \sum_{t=1}^{n} \frac{FCFE_t}{(1+k_e)^t} + \frac{FCFE_{n+1}}{(k_e - g_s) * (1+k_e)^n}$$

(ibid., 119)

Reckoning the dividend smoothing policy the value obtained by DDM can be lower (given the actual and objectively projected data) (ibid., 120)

Similarly to the DDM

$$EqV_0 = Excess\ (deficit) Capital\ + DCF\ Value$$

However, excess capital can be added here both as a lump sum or smoothed over years.

The DCF tends to be more accurate in cases when dividend pay-out policy is not transparent, the data is not available but tend to be more costly.

9.2.3. Residual income valuation model

Residual income valuation model (RIM) is calculates the value of the company as the sum of the current book value and the discounted flow of the residual income (excess return) over the valuation horizon. Herewith residual earnings or excess return is the surplus over the COE (Nissim, 2010a: 148). The advantage of RIM is the focusing on value creation measurement rather than on distribution. The current book value and residual income capture within the explicit forecasting period large part of equity value (ibid., 149).

The excess return model is a widespread instrument to assess both the non-financial and financial value creation. It is basically the sum of the invested capital and the discounted excess returns expected to be generated in the future (Massari, 2014: 120). Excess return is defined as the difference of the return on the invested capital and the COE. Considering the equity valuation application for financial companies the excess return model takes a form.

$$EqV_0 = \ EqC_0 + \sum_{t=1}^{n} \frac{ER_t}{(1+k_e)^t}$$

Where additionally

EqC_0: Equity Capital at the timepoint of valuation

ER_t: Excess Return in the subsequent forecasting periods also defined as

$$ER_t = (ROE_t - \ k_e) * EqC_{t-1}$$
$$ER_t = Net\ Income_t - k_e\ * EqC_{t-1}$$

For the accurate application of the RIM the data on net income and the growth projection and analysis should be available. The constant growth rate assumed in all three fundamental models is taken not less than long-term economy wide nominal growth rate after the steady state is achieved during the explicitly forecasted period. However, practically this explicit period lasts

about 5 years (ibid, 149). Similar to the DDM and DCF model depending three stages related to the growth pattern can be applied.

Applying the first stage

$$EqV_0 = BV_0 + \frac{ER_1}{k_e - g_s}$$

Where

EqV_0: Equity Value at the time point of valuation

BV_0: Book Value at the time of valuation

ER_1: Excess Return in the subsequent period assuming its stability

Two stages model

$$EqV_0 = BV_0 + \sum_{t=1}^{n} \frac{(ROE_x - k_e) * BV_{t-1}}{(1+k_e)^t} + \frac{(ROE_s - k_e) * BV_n}{(k_e - g_s) * (1+k_e)^n}$$

Year by Year

$$EqV_0 = BV_0 + \sum_{t=1}^{n} \frac{(ROE_t - k_e) * BV_{t-1}}{(1+k_e)^t} + \frac{(ROE_s - k_e) * BV_n}{(k_e - g_s) * (1+k_e)^n}$$

(Massari, 2014: 121 f.)

Peculiar for the bigger financial companies is to generate no value in the stable growth phase. Due to the lost of the competitive advantage the ROE almost equals COE bringing the terminal value to zero.

Excess return model drivers are ROE, growth and net income. They are widely used in comparison of homogenous group of companies and in the relative valuation as well as value maps (ibid., 122). Although ROE should be adjusted for the excess capital. The idea is discussed under the Solvency II regulation chapter. The excess capital turns out to bear opportunity costs by investing it in only risk-free assets but not in the risky enough assets that the regulatory capital allows. The adjustment should be done as follows:

$$ROE_{adj} = \frac{Net\ Income - EXC * r_f * (1 - t_r)}{EqBV - EXC}$$

Where

EXC: Excess Capital

r_f: risk-free rate

t_r: corporate marginal tax rate

Similar to the DDM and DCF model the financial company value equals to

$$EqV_0 = Excess\ (deficit) Capital\ + RIM\ Value$$

(ibid., 122).

According to Nissim (2010b) the insurance companies are the good example to use the residual income model (Nissim, 2010b: 2). Based on the sample of US companies from 1981 till 2010, the book values are relatively close to market values or intrinsic equity value, unrecognized intangibles are relatively small, the regulatory capital reflects the riskiness of activities. Thus, book values of equity capital are a reasonable measure for insurance business estimation. The P/B value tends to be closer to one in insurance industries and the terminal value has than smaller impact on value than in other industries (Nissim, 2010b: 3). The residual income valuation model in terms of Nissim (2010b) is redefined as comprehensive income available to common equity holders and the book value of common equity holders. This is the sum of the change in common equity and the comprehensive income.

The earning forecast errors are offset by the impact on book values. In the insurance companies the measurement error supposed to be smaller (Nissim, 2010: 9). As to the riskiness of cash flows the life insurers have lower equity ratios what suggest the higher risk premium than with non-life insurers. On the other side the claims and benefits of non-life are more volatile than those of life whose claims are often the face value. The distribution of non-life claims is skewed and heavy tail what imposes the non-normality and higher risk premium. Over time the equity risk premium changed significantly only during the crisis of 2008 -2009. Whereas in the time of the low interest rate environment the implied costs of equity calculated with RIM fall due to the risk premium fall. In the cross-sectional analysis, the determinants for the ICEC change were identified as (care only about mean and variance as for a normally distributed returns) kurtosis and skewness, as well as idiosyncratic volatility, and size (with negative sign). The equity premium is positively related to market beta, idiosyncratic volatility, book -to market ratio (but negatively relate to co skewness, size and equity asset ratio. With the significance in equity- to- assets ratio consistent with the leverage. The premium of the ICEC was positively correlated to inflation and unemployment in the years of uncertainty (2008-2009) and negatively to 10 years treasury bond. (Nissim, 2010b: 34-40).

Combining the fundamental and relative valuation Janda&Kaszas (2017) also point out to the significance the earning stability on the valuation of a company with the price to earnings multiple derived from the RIM model. Formally,

$$EqV_0 = BV_0 + \sum_{t=1}^{\infty} \frac{E_t - BV_{t-1} * k_e}{(1 + k_e)^t}$$

Where:

EqV_0: Value of the equity (company) at the timepoint of valuation
E_t: earnings
k_e: costs of equity
BV_{t-1}: Book Value of equity in the following periods

That means, that the residual income is a difference between the earnings and the book value of the previous year multiplied by the CoC (Janda&Kaszas, 2017:3). Assuming the stability of earnings in the perpetuity the multiple is in fact derived as inverse of the COC. This makes it simple and useful in the relative valuation model applied also to financial firms (ibid., 5). Assuming the GGM in the steady state the multiple can be derived as:

$$EqV_0 = MV_0 = BV_0 + \frac{E_t - BV_0 * k_e}{k_e}$$

$$MV_0 = \frac{E_t}{k_e}$$

$$\frac{MV_0}{E_t} = {k_e}^{-1}$$

Janda&Kaszas (2017) prove the model and the precision of valuation by comparisons the results of the logarithm regression of market values on earnings and comparing it to the realized market values (ibid., 8f.). The proponents of the residual income valuation find RIM suitable due to the relative precision and measurement of the economic value adding process (Harris et al, 2008:197). Similarly, Harris et al (2008) reacts to difficulty in assessment of pension liability cash flows, especially in the terminal value when applying the DCF valuation model (Harris et al, 2008: 208).

9.3. Relative valuation

9.3.1. Valuation by multiples

The relative valuation techniques or the valuation by multiples is based on the idea “that similar assets should have similar prices on the market” (Massari: 2014: 123). *Multiples are the adjustment or an estimation of a firm value by reference to the observed prices and fundamentals of peer companies which are the comparable firms. The key role plays the fundamental driver such as* earnings, operating cash flow, book value of equity. It is important to choose a right sample of peers to reflect the market sentiments and provide external consistency. The multiple is then calculated as the product of the ratio obtained from the market data and the firms fundamental. Efficient markets should provide enough information for the multiples calculation.

Depending on the data available one should carefully choose the moments of measurement (mean, harmonic mean, median) to exclude the influence of outliers. Additionally, one can check the accuracy of multiple valuation by comparison to observable market prices. The conditional multiple valuation or the value map techniques has been proved as an efficient method. The advantage of this method is the relation of two or more fundamentals to each other given the joint distribution of them. This technique allows also to calculate more exact implicit price form the data observable on the peer group. In the following some technical aspects of data mining and multiple derivation will be discussed in general. Then the specific application to financial and insurance companies will be analyzed.

Comparable companies' choice is the trade-off between the information mining costs and information accuracy. The aspect to consider are:

- Line of business (life, non-life share in the premium writing)
- Structure of clients (industrial, personal)
- Asset allocation and riskiness
- Solvency ratio and risk capital adequacy
- Leveraging in general
- Performance indicators (ROE, earnings, the growth potential)
- accounting quality and reporting principles resp. standards.
- Price observable on the market not form deal multiples which can be biased

Technically, the statistical quality of information can be distorted through outliers. To avoid this drawback, one can compare different moments of measurement (mean, median). Considering the simple mean and harmonic mean the latter have an advantage being robust against outliers (Massari, 214; 123).

Generally, the harmonic mean is calculated as follows:

$$HM = \frac{1}{\frac{\sum E/P}{N}} = \frac{N}{\sum (P/E)^{-1}}$$

Where:

HM – harmonic mean

P- market price of a sample company

E – earnings of a sample company (Instead of E one can use also another fundamental such as book value (BV)

Applying it to simple numbers:

Table 13 Calculation of different types of means

P	E	HM	Mean	Aggregated Mean
20	2	13,9	17,6	18,8
62	2			
12	1			

HM = 1 / ((2/20 + 2/62 +1/12)/3) = 13,9
Mean = 20/2+62/2+12/1 = 17,6
Aggregated mean = (20+62+12)/(2+2+1) = 18,8

Source: own calculations after Massari, 2014.

The rules of data accumulation foresees the following frequency of mining.

- Current or obtained from the latest available yearly reports
- Trailing or obtained on the quarterly basis and aggregated if needed
- Forward or obtained from the expected earnings over the next or subsequent years (Massari,2014: 126).

Financial companies' valuation is the equity-based valuation. Thus, it is reasonable to use the equity related multiples with fundamentals such as earnings (net income), book value, tangible book value. There most productive multiples are short listed in the following table. Other multiples cam be used to provide a benchmark for the peer group choice and assessment.

Table 14 List of multiples chose valuation financial companies

Formula	Fundamental	Equivalence, if capitalized
Price/Earnings (P/E)	Earnings	Price per share/ Earnings per share = Market Capitalization/ Net Income
Price/Book Value (P/BV)	Book value of the equity	Price per share/ BV per share = Market Capitalization/ BV
Price/Tangible Book Value (P/TBV)	Tangible Book Value (= Book Value of the Equity – Intangible Assets)	Price per share/ TBV per share = Market Capitalization/TBV
Price /(MC) Embedded Value	Market Consistent Embedded Value	
Price/Deposits	Deposits	$Price\ per\ share$/ Deposits per share = Market Capitalization/ Deposits
Price /Revenue	Revenue	Price per share/ Revenues per share = Market Capitalization/Revenues
Price/Operating Income	Operating Income before Extraordinary Items and Taxes	Price per share/Operating Income per share = Market Capitalization/Operating Income
Price/Net Asset Value (P/(A)NAV)	(A)NAV	Price per share/NAV per share = $Market\ Capitalization$/NAV
Price/Assets Under Management (P/AUM)	Assets Under Management	Price per share/AUM per share = Market Capitalization/AUM
P/Branches	Number of branches	Price per share/Number of branches per share = Market Capitalization/Number of branches
Price/Premiums	Premiums	Market capitalization / Premiums
P / EV	EV	Market capitalization / Embedded Value

Source: Massari, 2014: 127, 215.

For valuation of a financial company the price-to-equity (P/E) and price to book value (P/B) are commonly used (Massari: 2014: 128). Earnings can be differentiated in the IFRS based or Embedded Value based earnings. Adjusted Net Asset Value can be chosen in case of liquidation, but has less explanatory power due to the subjective assessment of the growth potential (Massari, 2014: 129).

9.3.2. Derivation of multiples and valuation methods consistency

Derivation of multiples based on the transformation of valuation model into multiples, so providing the coherence between the fundamental and relative valuation (Massari: 2014: 131). The idea beyond the multiple derivation is that all discounting models (DDM, Excess Return, DCF) should bring the same result provided the identical data and assumptions on growth, dividend pay-out, earnings. As the starting point one can use ether the DCF or DDM model. The Gordon Growth Model (GGM) (as the simplest case of the DDM) provides the relation:

$$P_0 = \frac{DPS_1}{k_e - g_s} = \frac{EPS_1 * p_s}{k_e - g_s}$$

Where: DPS - dividend per share

EPS – earning per share

0,1,2 … - periods of time

k_e - cost of equity

g_s - growth in the stable phase

p_s – pay-out ratio in the stable phase

Division by EPS_0, EPS_1 one gets current resp. forward multiple.

With growth $\frac{P_0}{\mathrm{EPS}_0} = \frac{(1+g_s)* p_s}{k_e - g_s}$ resp. $\frac{P_0}{\mathrm{EPS}_1} = \frac{p_s}{k_e - g_s}$

without growth $\frac{P_0}{\mathrm{EPS}_0} = \frac{P_0}{\mathrm{EPS}_1} = \frac{p_s}{k_e}$

inserting $p = 1 - {}^{g}/_{ROE}$ the multiple takes a form

$\frac{P_0}{\mathrm{EPS}_0} = \frac{(1+g_s)*(1-{}^{g_s}/_{ROE})}{k_s - g_s}$ resp. $\frac{P_0}{\mathrm{EPS}_1} = \frac{1-{}^{g_s}/_{ROE}}{k_s - g_s}$

This equation can be applied ot the phases f the extraordinary growth or the year-by-year dividend resp earnings forecasting assuming that COE > g

$$P_0 = \frac{EPS_0 * p_x * (1+g_x) * [1 - {(1+g_x)^n}/{(1+k_e)^n)}]}{k_e - g_x} + \frac{EPS_0 * p_x * (1+g_x)^n * (1+g_s)}{(k_e - g_s) * (1+k_e)^n}$$

Where:

EPS_0 : Earnings Per Share in the period 0

p_x : payout share in the extraordinary growth phase

p_s : payout share in the stable growth phase

g_x : extraordinary growth rate

g_s : stable growth rate

k_e: costs of equity

Deriving the P/EPS multiple

$$\frac{P_0}{\mathrm{EPS}_0} = \frac{(1 - {g_x}/{ROE_x}) * (1+g_x) * [1 - {(1+g_x)^n}/{(1+k_e)^n)}]}{k_e - g_x} + \frac{\left(1 - {g_s}/{ROE_s}\right) * (1+g_x)^n * (1+g_s)}{(k_e - g_s) * (1+k_e)^n}$$

Where additionally:

ROE: Return on Equity in the extraordinary reps. stable growth phase approximated as average and calculated as = Net Income/Book Value ratio (Compare with Massari, 2014: 132)

The drivers of the multiple are observable.

1. Payout ratio increases the multiple
2. Cost of capital and its riskiness decreases the multiple
3. The growth rates increase the ratio ((as long as ROE is higher than the cost of capital).

Considering the equation BV_0* $ROE_1 = EPS_1$ and $p = 1 - {g}/{ROE}$ (coming from the calculation of the sustainable growth rate)

The equation

$$\frac{P_0}{\mathrm{BV}_0} = \frac{ROE_s - g_s}{k_e - g_s}$$

is the **warranted equity method** focusing on the difference of spreads of numerator and denominator which depends on the ($ROE_s - k_e$) spread. If the spread is positive, the company is creating value and it worth more than a current book value. The same way can be treated also P/TBV with the ROE substituted by ROTE (ebd.133; Damodaran, 2009: 28). As it has been stated

in the beginning of this subchapter this equation provides also consistency between all fundamental valuation models.

Specific to the insurance companies in the relative valuation is the choice of multiples based on the profit drivers. Similar to the banks multiples such as P/BV, P/E, P/TBV are mostly applied to the insurance company valuation. In particular, insurance multiples are the P/Premiums, P/ EV.

Starting from the DDM with assumptions that Div_t = Net $Income_t$

Price (P) can be assessed as the discounted Net Income in the steady state.

$$P = \frac{NI}{k_e}$$

Reformulating NI as the sum of costs and premium and investment income

$$P = \frac{Premiums + Nen\ Investment\ Income\ (NII) - Claims - Operating\ Expenses}{k_e}$$

The rearrangement of the formula and dividing by premiums leads to

$$P = \frac{1}{k_e} * \frac{Premiums + NII - (Claim + Operating\ Expenses)}{Premiums} =$$

$$= \frac{1}{k_e} * (1 - COR + IL * r_{inv})$$

Where

$$COR = \frac{(Claim + Operating\ Expenses)}{Premims}$$

$$IL = \frac{NII}{Premiums}$$

r_{inv} : investment return rate

Thus, the multiple is divided as the discounted sum of insurance and investment activities. It is positively driven by underwriting and investment result and negatively influenced by the risk taken in the underwriting and investment activities. EV as the multiple driver depends (similar to the book value) on its growth and risk taken in the costs of equity. Formally it can be decomposed into:

$$\frac{P}{EV} = \frac{ROEV - g}{k_e - g}$$

Where

g: is the growth of the company in the steady state

$ROEV$: Return in EV defined as ratio operating earnings after taxes to EV

(Massari, 2014: 215 f.)

9.3.3. Accounting aspects of fundamentals, cleaning of multiples

Additional accounting aspect of the multiple valuation that was already mentioned in the chapter with the accounting quality issues, is the cleansing multiples from insurance specific components such as AOCI, DAC amortization, excess capital, unrealized gains and losses on tradable securities. Considering the above mentioned consistency of models, this technique guarantee the usage if identical data resp cash flows in all models.

In the P/B ratio AOCI as a part of equity book values can distort the sustainable value with considerable volatility beyond the fact that are not the items in the process of value creation.

AOCI defined as "a line item in the shareholders' equity section of the balance sheet that includes income that is not reported in the income statement". It includes unrealized gains and losses on certain types of investments, on pension funds and foreign currency transactions.[20]

From the financial report of the Vienna insurance Group is evident that AOCI as theoretical explained are quite volatile across years. In fact they amounted about -102 mln in 2015 and increased up to more than 50 mln in 2016.

Figure 9 AOCI in the consolidated statement of VIG for 2017/ 2016 fiscal years

CONSOLIDATED STATEMENT OF COMPREHENSIVE INCOME

in EUR '000	2017	2016
Result of the period (carryforward)	372,591	320,990
Other comprehensive income (OCI)		
Items that will not be reclassified to profit and loss in subsequent periods	7,210	-52,323
+/- Underwriting gains and losses from provisions for employee benefits	13,022	-98,281
+/- Deferred profit participation	-3,362	29,833
+/- Deferred taxes	-2,450	16,125
Items that will be reclassified to profit or loss in subsequent periods	82,032	103,063
+/- Exchange rate changes through equity	60,172	-23,833
+/- Unrealised gains and losses from financial instruments available for sale	24,119	509,775
+/- Cash flow hedge reserve	621	4,571
+/- Share of other reserves of associated companies	3,139	-195
+/- Deferred mathematical reserve	17,698	-97,705
+/- Deferred profit participation	-19,723	-253,191
+/- Deferred taxes	-3,994	-36,359
Total OCI	89,242	50,740
Total profit	461,833	371,730
thereof attributable to Vienna Insurance Group shareholders	385,487	338,817
thereof other non-controlling interests	7,903	6,312
thereof non-controlling interests in non-profit societies	68,443	26,601

Source:www.vig.com

Similarly to fundamental models, the excess capital is the cap over the regulatory requirements that can be subtracted both from the price and book value to make the ratio more accurate (Massari, 2014: 128). It is related also closely to the risk profile of the firm, because the

[20] https://www.investopedia.com/terms/a/accumulatedother.asp#ixzz54OCGLhKA

excess capital is supposed to be invested in risk-free investment bringing no return. The market prices should then reflect the intrinsic value more accurately.

$$\frac{P}{BV_{adj}} = \frac{P-EC}{\mathrm{BV}-\mathrm{EC}}$$

If P = 75 and BV = 50, the P/BV = 1,5, whereas with the EC = 18 it P/BV_{adj} = 57/32 ≈ 1,8. (Compare Massari, 2014:128).

Additional accuracy can provide the ratio P/TBV. Subtracting all intangible assets which are not liquid and marketable in case of capital deficit only the TBV has a solid basis. (see also the chapter on Solvency)

In case of P/E ratio unusual or one-time influences are removed, e.g. extraordinary items, the charges for discontinued operations, other one-time charges. However, as has been discussed above all adjustments should be internally and externally consistent. Similar to the book value cleansing from the excess capital it is deducted from the market capitalization with the face value, while only earnings after taxes on this excess capital deducted on the income statement.

9.3.4. Value map and regression model method

The conditional relative valuation or value map provide more stable valuation result because it includes the dynamic of two or more fundamentals. Herewith one fundamental is dependent on the other given their joint distribution. Technically it is a bivariate or multivariate OLS regression. For instance, P/B or P/E can be regressed on ROE, ROAE, ROTE, ROA (ratio between the operating income and the total assets).

Although, all aspect of the regression estimation (i.e. five basic assumptions) should be considered and analyzed carefully. On the other hand, it provides more accurate result for the valuation, as well as fits the DCF or DDM. Additionally, only the cross correlation models provide the robust result given the consistent sample of peer companies. It is not uncommon, that the large sample is dispersed reps the small sample not normally distributed (consider skewness). In this case, the quasi linear regression could be used to achieve the higher goodness of fit (GOF). For instance,

$$\frac{P_0}{\mathrm{BV}_0} = a + b * ROE + c * ROE^2$$

Where a, b, c: are regression coefficients

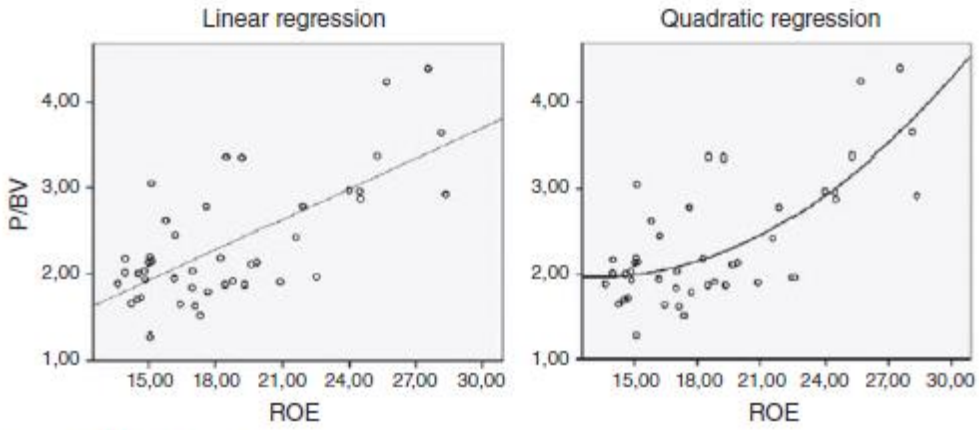
ROE: is regressor.

In the figure 10 the quasi-linear regression fits the relationship better with the higher goodness of fit R^2.

$$\frac{P_0}{\mathrm{BV}_0} = 3.412 + 0{,}218 * ROE + 0{,}008 * \ ROE^2$$

The regression is also used for fitting the fundamental models resp. to estimate the over/undervaluation provided the coherent (sub)sample. Additionally, the extension of the bivariate regression to the multivariate regression with the other variables approximating growth, risk, total capital ratio, stock beta, ROAE and other fundamentals could also provide accuracy of the valuation (Massari, 2014: 137). However, this sophisticated method is rarely used in the practice.

Figure 10 Value maps example for the sample of European banks



Source: Massari (2014:135)

One more aspect to consider in the multiple valuation is their accuracy. Nissim (2013) found out in general that:

- Valuation based on book value multiples are more precise (ibid., 327),
- Excluding AOCI does not improve results, because book value with AOCI decreases the risky credit spread (ibid: 328).
- Limitation of the sample to the closer peers improves valuation accuracy (ibid: 328).
- Using diluted instead of outstanding shares improves earnings-based valuations but not book value-based valuations (ibid: 329).[21]
- Overweighting /underweighting the earnings or book values could bias the estimation of the valuation performance.

[21] Measuring the accuracy of the relative valuation while considering the outstanding and diluted book value Nissim (2013) comes to a conclusion that using outstanding share improves the valuation accuracy. It is reasonable to include into book value employee stock options, convertible bonds, convertible preferred stock, and other securities that may be exercised or converted into common shares because they may dilute the claims of existing common shares on earnings and book value (Nissim, 2013: 335).

The accuracy of the multiple valuation depends on the difference between the market price as a benchmark and the estimated through multiples value. This difference results in turn from the “inefficient market pricing of comparable or from temporary shocks to the fundamental” (ibid: 330). In the earningvbased models Nissim (2013) proves empirically that the recurring income brings more stability and accuracy to the valuation in earning based models. Thus, excluding items which are transitory improves the performance of a multiple (ibid: 331). Using the forecasted value instead of historically reported can also improve the valuation accuracy. By its nature, the price contains the information from the future (expectations) and can be better reflected through the forecasted earnings (ibid: 331). The author considered also the quality of expenses and income matching. i.e. the precision of the reflection of costs incurred in generation reported revenue. For instance, immediate expensing of advertising can cause the mismatch (ibid: 332). Besides the problem can be caused by the internally developed intangibles (software, brands, human capital etc.) and conservative accounting rules (there are incurred but not capitalized costs (US GAAP)) (ibid: 332). Additionally, the discussed above technical aspects impact the accuracy. For instance, the harmonic mean was measured for each company from the sample. (ibid: 332).

Practically, the unique method is not applicable to the insurance company. Due to the combination of business line in one company and diversification of assets the methods Sum-of-the-Part and triangulation methodology is widely used. Beyond all, the “football field” method as a graphical and quantitative exemplification and comparison is used to establish an average price in case of M&A deals.

10. Practical implementation

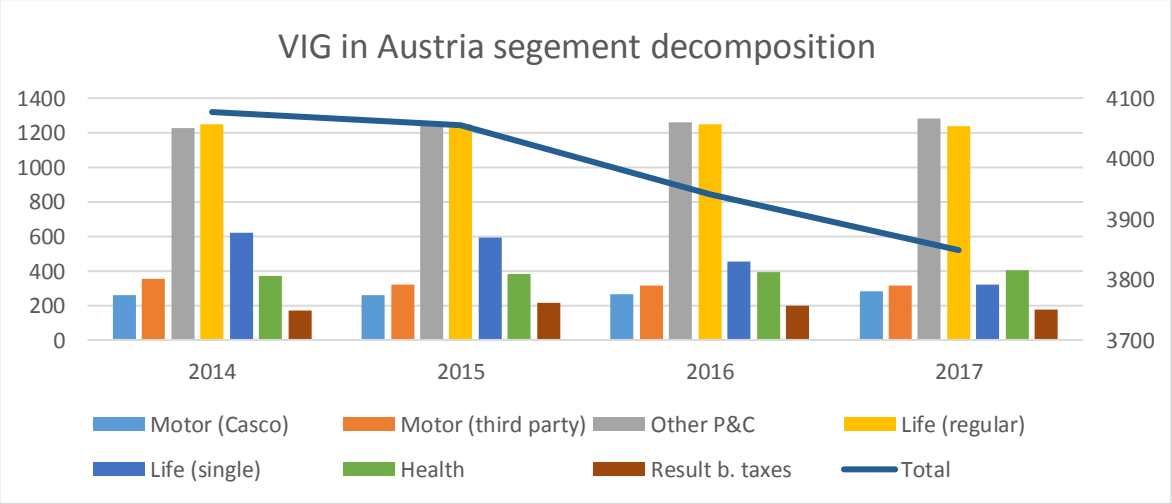
The purpose of this part is to implement models and approaches analyzed in the previous chapters in the valuation of a multiline insurer, the Vienna Insurer Group. The empirical data on VIG is taken from the official website i.e. Annual reports and presentations (Financial Report, MCEV, Solvency II report) accomplished by the data from the S&P Market Intelligence platform. It has been proved as a reliable data source by comparing the data provided with the official data.

Vienna Insurance Group (VIG) is the multiline insurance company the biggest insurer on the Austrian market accumulating about 24% of premiums collected in the last four years. It divided into life and health, property and casualty as the main segments. The health segment is a part of the life segment with the appropriate embedded value profit recognition and valuation. The reinsurance is delivered to the separate company within the holding. Consequently, those segments should be valuated separately. The MCEV of the life segment will be analyzed and estimated. The non-life segment value will be approached by fundamental methods method and compared with the warranted equity method. For those purposes the explicit period of five years from 2018 till 2022 will be forecasted. Thereafter the terminal value will be calculated under the

assumption of the constant growth in the steady state. This is considered a strong assumption due to the quite short period.

According to European Commission, Austria has a good outlook for the next years with the nominal growth rate about 2,0% - 2,5% due to the private consumption, investment and international trade activity. That allows to approximate the growth for the explicit period at 2,4% and for the steady state of nearly 2,0%. The growth in wage will support also the private consumption and indirectly the personal insurance sales. As the significant part of premiums in general is collected also in the CEE region the GDP growth there will impact the performance. The CEE growth is projected at 3,0% what enforces the good outlook for VIG. [22] The density (defined as insurance premium per capital as a proxy for market saturation) at the level of roughly 2153 USD (OECD Data) is lower than the OECD average of 2000. That empowers the forecast for sales. Additionally, CEE region is still the driver in sales due to the lower rates of penetrations and market saturation. The penetration rate in Austria is below 6%. The growth of the GPW implied from the GDP growth is assumed at the level of 1%. The premium percentage of Austrian business in VIF was about 41% in non-life, 46% in life, 95,8% in health, and 46% in total in 2015 with the slight increase to the previous year (VIF, 2016: 6). However, the total underwriting activity by segment and region has deteriorated in the life segment in Austria. On the level of overall profitability and growth, it indicates on the increase of CEE region in premium writing.

Figure 11 VIG in Austria segment decomposition



Source:, 2018, figures in mln EUR

The relation of GPE to GPW has been about 100% what indicates on the maturity of the non-life business. The premium retention ratio is assumed on the level of roughly 87% for the explicit period and for the terminal value calculation. The net claims ratio in the non-life segment

[22] https://ec.europa.eu/info/sites/info/files/economy-finance/ecfin_forecast_summer_12_07_18_at_en_0.pdf; VIG Annual report; OECD https://data.oecd.org/gdp/real-gdp-forecast.htm (retrieved on 22.8.2018)

based on the historical data from 2014 till 2017 is averaged on the level of 67% and assumed to be the same for the consequent years. Adding up the net expense ratio of about 29% the Combined ratio (COR) is assumed to be on the level of 93,5%.

Other assumptions include the effective tax rate on the level of 24%, investment yield on the average assets at 3,8%, reserves in non-life to the GPW at 119%. Due to the stable pay-out policy the dividends are assumed at 35% of the net profit.

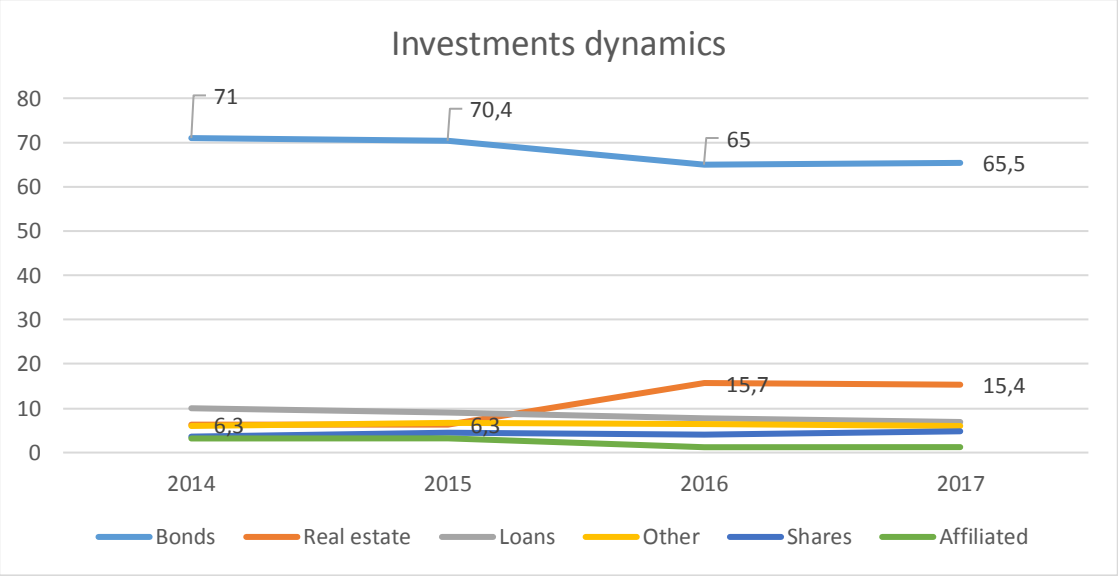
The projection of the income statement data was started with the GPW figures and the nominal growth was projected for the explicit period. Thereafter, the NPW based on the retention rate were calculated. They were slightly different as taken from the database probably due to the assumptions and approximations from the whole firm ratio. The same slight difference has been recorded in the NPE as percent in GPW. However, the claims and expense ratio, consequently the COR were reasonably calculated and were coherent with the firm report data. The non-life segment makes the underwriting profit of about 6%, what was projected for the explicit period and for the terminal value (TV) (compare VIG, 2018: 8 f.; 203). The investment results turned to be significantly distorted across information sources. It is quite troublesome to calculate the share of investment result in single sectors. The total investment result of VIG remains quite high above 800 mln. That can indicate also on the considerable result in the non-life sector. However, addition of underwriting and investment result shows significant deviation from the S&P MI data on profit and profit after taxes. Thus, the real data has been used for projections of the income for the explicit period and TV. Herewith the GWP growth rates were used as growth basis. See Table 17 in the attachment. It should be added that the claims' reporting obligatory due to their stochasticity brings useful information as the reference of the claims dynamics. The loss reserve and the claim payments differ significantly across years (4584001 vs 3158570 mln EUR in 2017), what in case of VIG results in the provision release. Additionally, it indicates on the conservative provision management and the income statement underestimation (see Annual Financial Report of VIG, 2017: 99).

Examination of the balance sheet brought the following results. The investments in the non-life segment in the based on historical data shew the growth of about 5%. The other important asset side items' growth was taken on the total firm basis (Intangible assets, fixed assets self-used lands and buildings, cash and equivalents). The provisions (reserves) should correlated with the investments growth. They were growing in the historical phase in fact at about 4,6%. The non-life provisions (acc. to S&P MI Database) took a share of 19% and are projected for the explicit forecasting on the same level. Subordinated debt as the part of Tier 2 has been improved in 2016-17 through inflow of high rated sub bonds. Due to the high rating of VIG (S&P : A+, 8.2018)[23] it is expected that VIG will be using its debt capacity for the regulatory capital support. Thus, the growth at the level of 19,7% could be reasonable. It should be noted that the growth in total

[23] https://www.vig.com/de/investor-relations/anleihen/unternehmens-rating.html

provisions slowed down in comparison to the non -life growth. That proves also the data on the Austrian branch above. It can indicate on the resifting of the investment items in favor of shorter bonds or equities. This in turn can change the risk profile of investments. As the short-term liquid high rating investments have the low interest return, the investment profit can be achieved through the riskier equity or real estate.

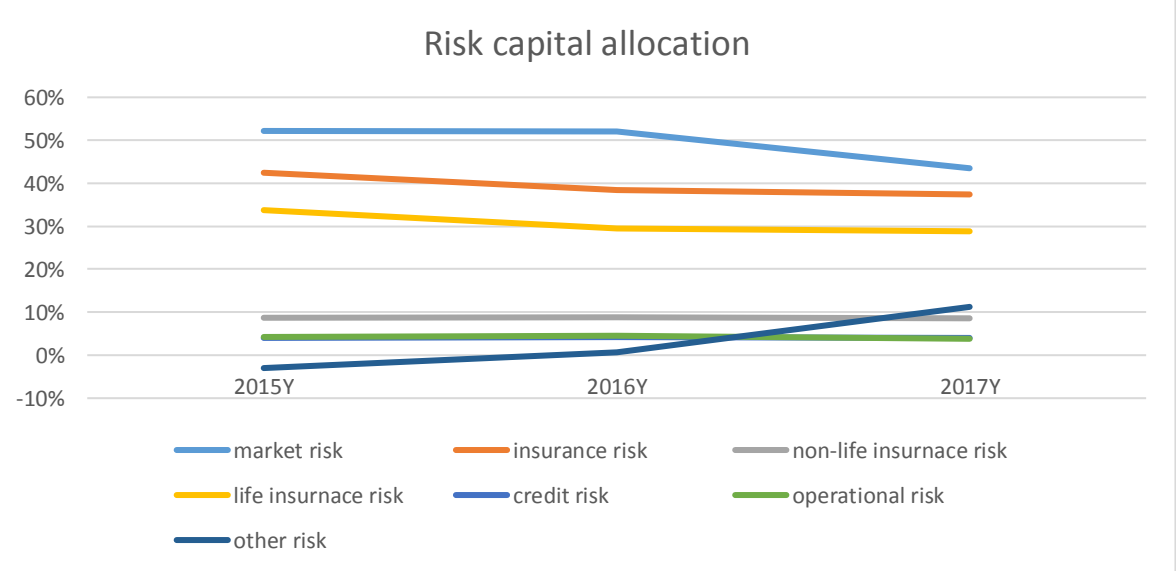
Figure 12 Total investment assets dynamics.



Source: Vienna Insurance Group 2016, Vienna Insurance Group 2018

However, the risk allocation of available solvency capital shows the dynamic in other risk hedging on costs of the market risk with considerable growth in available capital about 22% from 2015 till 2017.

Figure 13 Capital risk allocation dynamics



Source: S&P MI Database.

VIG is overcapitalized in terms of Solvency II. The SCR was 225% and grew by 31% from 2016. The projected Solvency ratio is projected at the level of 216%. Due to the increase on the solvency requirements based on the underwriting and investment profile the available capital should also grow. The dividends pay-out ratio (based on the de-facto paid dividends) excluding the one-time dividend payment of 192% of the net income was projected on the level of 35%. The total net income growth rate (considering the stable COR and the growth in CEE region) was projected roughly 3%. On this basis the dividends were projected with the growth respectively 3%. The tangible book value dynamics are quite volatile and cannot be projected with due precision.

Other important indicators elaborated theoretically take the following shape. The ratio of NPE / NPW close to 100% indicates on the maturity of this branch. The ratio of reserves roughly 110% with the visible decreasing rate in the historical period indicates on the narrowing base of unearned premiums. However, the investment base growth of roughly 5% can be achieved through the selling expansion. It can be assumed that VIG is pursuing the soft market strategy. The RoE had the positive trend and high result of about 6%. (S&P data has a slight deviation from the calculated coefficient). he RoTBV is above 13% hat indicates on the inflated with intangibles shareholders capital (See Table 20).

The calculation of Costs of Equity the CAPM was exploited. Initial larger group was used based on the total assets value, market capitalization, net claims ratio, gross premiums written, dividend payout ratio. Herewith the peer group was short listed from multiline companies, similar in terms of ROAA, ROAE, P/B, P/TBV, P/EPS. The sample was cleaned for outliers. The mean and median beta calculated roughly 0,7. That means that VIG and its peer group is precepted as quite sure asset relative to the market volatility (Table 21 - 23). The adjustment procedure resulted in beta = 0,8. The reasonable reference is the industrial beta that can be mined on the website of Prof Damodaran.[24] For insurance non-life sector it is 0,84 and 1,01 for life sector. The market European STOXX index was chosen as balanced market reference rate in the 1Y horizon.[25] Although the author entrusted for the ultimate calculation of CoE the VIG calculation (VIG, 2018: 54).

> *"To calculate the discount rates, the capital asset pricing model (CAPM) is used to calculate a cost of equity capital. The risk-free interest rate (equal to the yield on German government bonds on the reporting date calculated using the Svensson method), country-specific inflation differentials and risk premiums, and sector-specific market risk are added*

[24] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html
[25] https://www.stoxx.com/document/Bookmarks/CurrentFactsheets/SXXGR.pdf

to this. The base rate before inflation differentials was 1.34% (1.03%). The market risk of 6.16% (6.25%) was multiplied by a beta factor of 0.96 (0.96) that was calculated based on a specified peer group".

Assumingly, the company is using the all bond yield curve with 10 years maturity resp with higher rated bonds but applying (as stated) the country risk premium.[26] The authors calculation and the VIG based calculation has a difference of 1,25% (see Table 23).

Coming finally to the value calculation the DDM model was used based on the dividend capacity calculation exploited in practice by Uniqa Insurance Group for Non-life segments.[27] As has been previously outlined, this methods is based on the discounting the potential dividend capacity calculation distributable to shareholders. Herewith the capital buffer is calculated in chains year by year resulting from the claims resulted or NPE (see the table 26). The data calculated as dividend capacity was discounted in the explicit period and in the steady state under assumption of the constant growth of 2% (see Table) . The result equals appr. 2 154 744 thsd EUR. Herewith the explicit period value consists of 25% and TV of 75% what makes this result very sensitive to assumptions. The MCEV result for 2017 published by VIG resulted in 4 504 585 thd EUR.

Thus the SoP = MCEV + IFRS non-life value = 2 154 744 + 4 504 585 = 6 659 329 thd EUR.

However, it must be considered that the MCEV is highly sensitive to the macroeconomic indicators i.e. to the market risk and equity and property values as main investment assets. The deviation of +/ - 1% in yield curve causes the change of MCEV by 215 027 / - 502204 thsd EUR, and deviations of equity and property values by -10% causes the decrease of – 157 204 thsd EUR (VIG, 2018a: 15). It should be noted that in the CEE region the inverse relationship of value and yield curve movement is recorded. This is due to the fact that they have longer duration bonds on the liability side than on the asset side or market spread guarantees.

Coming to the relative valuation methods in particular to the Warranted Equity Method, it resulted in the value of 7883281,203 thsd EUR. Here the P/BV multiple was derived from fundamentals according to the formula (for details see Table 30).

:

$$\frac{P_0}{\mathrm{BV}_0} = \frac{ROE_s - g_s}{k_e - g_s}$$

[26] https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html

[27] The learning material from the course Valuation in WS 2016 at the University of Vienna was used as the methodological reference.

The last fundamental method RIM applied to non-life including the MCEV resulted in 8 238 088 thsd EUR or 64 EUR per share (128 mln ordinary shares). The DDM model applied to the total company dividends applying the simple Gordon Growth model results in 3 896 011,02229 thsd EUR or per share roughly 30 EUR. This result is yet the closes to the market share of about 25 EUR.[28]

Applying the relative valuation methods: multiples and value maps bring the following results. The multiples P/B and P/EPS obtained from the S&P database from the short listed peers (Table 33) brings close results of 4 269 283,74 thsd EUR resp 4763931,19 thsd EUR or per share 33,35 EUR resp 37,22 EUR applying mean as the first moment.

Regressing P/B on ROAE based on the sample of 88 different European insurers in the broad range of dependent and independent variable shapes brings the result from 3969798,071 thsd EUR to 5 156 388,73 thsd EUR depending on the underlying ROE. For details of calculation see Attachment 2.

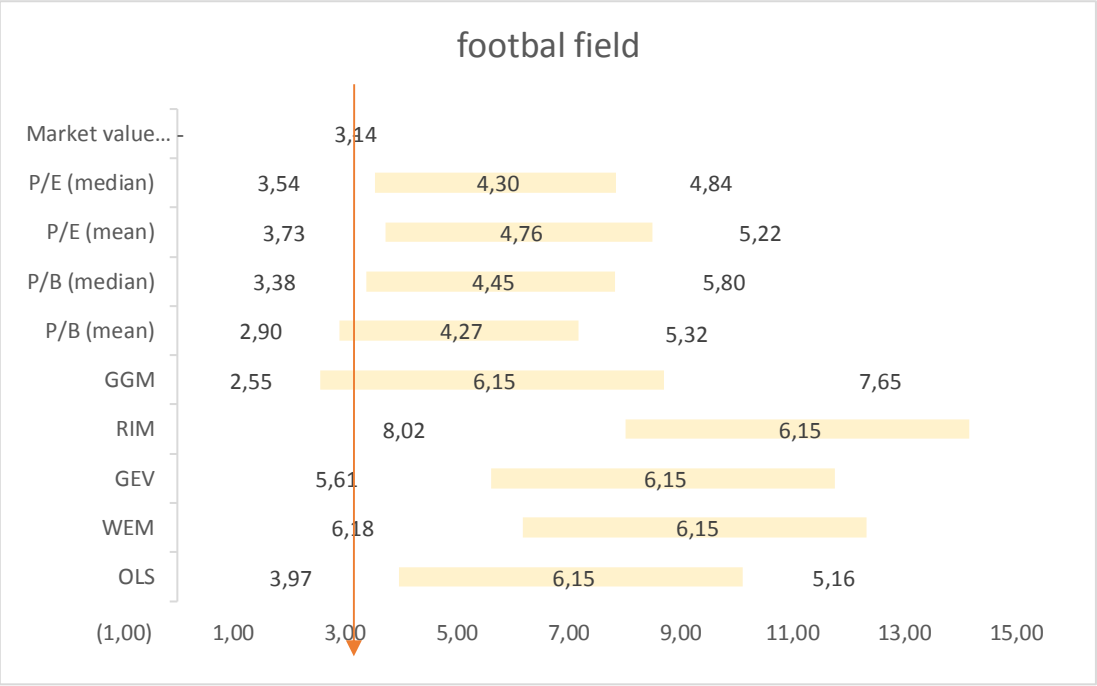
Table 15 Valuation models summary

	Min	Value	Max
OLS	3 969 798	4 566 200	5 156 389
WEM	6 181 414	7 883 281	9 656 703
GEV	5 607 165	6 659 329	7 655 664
RIM	8 017 620	8 238 088	8 592 411
GGM	2 551 084	3 896 011	7 653 252
P/B (mean)		4269284	
P/B (median)		4447273	
P/E (mean)		4763931	
P/E (median)		4300704	
Market value (calc)		3136000	

Source: own calculations, https://www.bloomberg.com/quote/VIG:AV

Figure 14 Football field

[28] https://www.bloomberg.com/quote/VIG:AV



Source: own calculations

It should be concluded, that the implementation of the models brings quite heterogenous results. While the relative valuation models resulted in the market value closer to the market capitalization of roughly 3,2 bln EUR, the fundamental models deviate considerably form it. It can be a consequence either of unprecise data mining, strong assumptions, approximations or omitting of some valuation aspects.

The MCEV, based on the reported result, is highly sensitive to the investment yield deviations, their volatility and equity value. The broad range of values resulted from the volatility to the COE and growth that were taken in the range of +/- 1% respectively.

Conclusion

The object of the current paper is the valuation models applied to financial companies. Differentiating valuation models in fundamental and relative, only the equity based in both cases is applied. The reason is a business model of financial companies with distinct features such as high leverage is transformed into assets like raw material, beta should not be unlevered and levered, the capital regulatory framework in the industry makes emphasis on the capital management and the adequacy of own funds for the financial and operational risk management purposes. Generally, the fundamental models are the DDM, DCF, RIM model. They depend on the case and firm data availability. While the DDM depends on the predictable dividend policy, DCF relies on the adequate and exact data for the projection. The RIM model reflects the value creation, however like DDM and DCF depends on the future earnings projection and the adequate return on earning calculation.

The scientific discourse in the domain of valuation is concentrated on the fact that insurance business is the balance sheet or liability driven business because of premium generation function of the liability side. The cash-flows generated by premiums are an object of thorough examination and consistency with corporate finance theoretical frame work. In particular, Babbel (2002), Engsner (2017), Girard (2002) are discussing under the different angles the application of the risk-free rate and the options like premium to the valuation of risky liabilities. The motivation for this discussion is the probability of own default risk, as well as exposure to underwriting risks, which however are consider in some case being orthogonal to the market dynamics. The risk neutral probabilities should be preferred then in the valuation of the optionality. This fact is also consistent with the EIOPA insurance valuation framework. Girard (2002) connects the peculiarity of the insurance business to the Modigliani-Miller theorems in terms of capital structure and costs of capital. The CoC is adjusted to the risk and capital structure of the insurance company. Differing the valuation method in the direct and indirect ones, they should under the same considerations bring the same value. The replication portfolio of corporate bonds is assumed not to be the adequate asset if the risk-free is applied, as Babbel (2015) argues. Chen (2011) suggests that combination of the corporate pension plans and the insurance company assets turns to be more risky if they are correlated and follow the Black-Scholes dynamics. This results in the adequate premium setting (what then result in the prudent margin).

Insurance companies make money based on the risk aversity of people and readiness to pay premiums for the sure outcome in the future. They pools risks based on the imperfect correlation of individual exposures. The main segments of insurance companies are life (including health) and non-life, while the reinsurance is often separated into sole firm. The revenue generation of life and non-life segments differs both in the source and risk. The life segment premiums have longer maturity horizon and considered to be volatile. The non-life premiums are

more stable, but the claims are often predicted imprecisely and should be adjusted to each peril. The investment income generates the larger part of the income in the life segment.

The main revenue driver on the balance sheet is the float or the time difference between the premiums received and benefits resp. claims paid. The balance sheet is pivotal due to the importance of Solvency capital management and asset allocation. The aggregate analysis of 108 European insurance companies from all segments but reinsurance and brokers show that the largest firms by assets are in the life segment or multiline. The same is valid for equity and net income after taxes. Investments comprise the biggest part of the asset side in multiline and life segments (up to 80%), while in the non-life segments the other investments comprise relative bigger part. Herewith government and corporate bonds, as well as available for sale comprise the biggest part of investments. However, life companies can have large volumes of unit-linked investments or Assets Under Management. It is the purpose of the asset liability management how to transform the maturity with the investment profit. As expected, shareholders' funds and technical provisions or underwriting reserves are the lion part of liability structure. The subordinated liabilities come up to 2%. The most critical item on the balance sheet are the non-life claims and life benefits (cash outflow in case of peril). They are the best estimate under list of actuarial assumptions such as mortality, lapse, morbidity, longevity, car accidence frequency and based on the historical data. The additional problem comes from undiscounted nature of non-life claims what deteriorates the value.

The main revenue driver of the income statement are the net premiums earned. The revenue recognition under GAAP or IFRS is a critical point. The main accounting conventions IFRS, cash and Embedded Value should come on the identical aggregate result but differ in profit smoothing over time. Herewith, the accounting quality plays pivotal role in valuation of company. The OCI is often excluded for valuation purposes because it includes unrealized gains and losses on marketable products that deteriorates the result of the period.

KPI are the anchor and benchmark for the historical analysis and further forecasting. The life and non-life sectors have both distinct and common KPI. Generally, the combined ratio is the key static indicator for non-life firms indicating on the underwriting profitability. The net investment income applies for both segments and points-out to the financial result. The growth indicators are used to project gross or net premiums. While the relation of premiums earned to written indicates on the company maturity coming close to one. The life segment has additionally indicators of new business performance , that however should be used with caution due to the high subjectivity of its estimation. Additionally, the risk adjustment of the returns that is visible through RAROC is important indication of value created related to the risks born. Due to the broad basis of investment assets the insurance companies (especially life) are exposed to the market risk and third-party liability risks. The non-life depends on price and GDP cyclicality.

Economic capital and solvency regulation plays the most important role in the DDM model and in the whole insurance business, because it affects the underwriting capacity and

consequently profitability. The calculation of the recent approach of regulatory capital buffering bases on the Solvency II regulation and complimented with own risk capital modeling.

The cost of equity calculation is based typically on the CAPM model. The risk premium is calculated based on the covariance of own sick distribution of the market stock or beta. The carefully chosen peer group for the cross-sectional beta calculation is important.

Forecasting of the explicit projection should follow the principle of consistency, i.e. internal and external one. The life segment valuation uses the embedded value method or the present value of the contracts in-force. The fundamental models applied to the non-life segment should be consistent with each other. All fundamental models are adding the excess capital to the present value of profits. The relative valuation is based on the comparability of fair values of firms in the same segment, industry, size or region.

The theoretical models were applied to the Vienna Insurance Group, the largest insurer by revenues in Austria. Herewith the life and non-life segment were valued separately adding them according Su-of -the-Parts (SoP) method. The reported MCEV of VIG shows significant sensitivities on the interest rates and equity prices, what also impact the exactness of the valuation model. The DDM model was applied in the form of the GGM model and in the explicitly forecast of dividend capacity based on the Solvency Requirement calculation. Additionally, the Warranted Equity Method as multiples from fundamentals has been applied in line with simple multiples and value map methods. The results are more consistent and coherent for the relative valuation models and are close to the GGM model. This suggests that the company is slightly underpriced on the market, while the GGM model result in the most close result to the market value per share. Whereas the fundamental models indicate on th large deviations from the real market price and considerable sensitivity of terminal value on growth and cost of equity. According to them, VIG is considerably underpriced.

It can be concluded that the fundamental models require the immense time effort, calculation accuracy and the long practice in analysis of KPI in insurance. They wake interest and motivation as to the further research in cost of capital for insurance company and solvency capital optimization for the purposes of dividend capacity maximization and risk adjusted return maximization. For the practical purposes, the relative valuation is less costly and rather reflects the market expectations for the observable future.

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Attachment 1

Abstract

The research object of the current master thesis is the valuation models and techniques applied to financial companies. Particularly, the insurance company is selected as the practical implementation. The current work gains insight into the current research on the topic, analyses the business model. It thoroughly examines the balance sheet and income statement items in terms of revenue generation and recognition. Furthermore, the key drivers and performance indicators are analyzed also for the purposes of the practical implementation. The analysis of valuation techniques and models includes forecasting considerations, i.e. consistency principles. It focuses on the interdependencies in the models and between them. In particular, the fundamental models, relative valuation techniques are considered. The paper proves partially the consistency of result with the market price observation for the valuated insurance company based on the relative valuation but points out to its underpricing based on the fundamental valuation.

Zusammenfassung

Gegenstand der vorliegenden Masterarbeit sind die Bewertungsmodelle und -techniken in Bezug auf Finanzunternehmen. Insbesondere wird die Versicherungsgesellschaft als praktische Umsetzung ausgewählt. Die vorliegende Arbeit gewinnt Einblick in die aktuelle Forschung zu diesem Thema und analysiert das Geschäftsmodell. Es prüft die Posten der Bilanz und der Gewinn- und Verlustrechnung in Bezug auf die Erwirtschaftung von Erträgen und deren Erfassung. Darüber hinaus werden die wesentlichen Treiber und Leistungsindikatoren auch für die praktische Umsetzung analysiert. Die Analyse von Bewertungstechniken und -modellen umfasst Prognosemethoden, und zwar Konsistenzgrundsätze. Es konzentriert sich auf die Interdependenzen in Modellen und zwischen ihnen. Insbesondere werden die fundamentalen Modelle und relative Bewertungsmethoden betrachtet. Das Papier belegt teilweise die Konsistenz des Ergebnisses mit der Marktpreisbeobachtung für das bewertete Versicherungsunternehmen bei der relativen Bewertung, weist aber auf dessen Unterbewertung aufgrund der fundamentalen Bewertung hin.

Attachment 2

Table 16 Macroeconomic and internal firm assumptions

	historical anlaysis					explicit forecasting					
Macro	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	TV
GDP, Austria, bln EUR, %	306759	309213	312614	317149	326721	335869	342922	351153	359580	368210	
growth real,%	0,00	0,80	1,10	1,50	3,00	2,80	2,10	2,40	2,40	2,40	2,00%
Aggegated GWP Dynamics											
GWP / GDP, %	6,17%	6,01%	4,89%	4,67%	4,67%	5,28%	5,28%	5,28%	5,28%	5,28%	5,28%
GWP Growth, %		-0,03%	-15,90%	-2,13%	1,00%	1,00%	1,00%	1%	1%	1%	1%
Firm's level											
Premiums dynamics											
GWP market share, %	23,90	23,80	23,70	24,20	23,40	24%	24%	24%	24%	24%	23,80
Retention ratio,%	84,28	83,19	83,32	91,04	91,47	86,66	86,66	86,66	86,66	86,66	86,66
NPE as % of NPW (via GPE/GPW)	101%	100%	99%	99%	99%	100%	100%	100%	100%	100%	100%
NPE / GPW, %	84,66	83,14	82,62	83,20	84,27	83,58	83,58	83,58	83,58	83,58	83,58
COR dynamics											
net claims ratio, %	69,41	65,82	66,71	66,92	66,27	67,02	67,02	67,02	67,02	67,02	67,02
net expense ratio, %	29,92	29,55	29,37	29,32	29,35	29,50	29,50	29,50	29,50	29,50	29,50
COR, %	99,33	95,37	96,07	96,24	95,62	96,53	96,53	96,53	96,53	96,53	96,53
Other assumptions											
Investment yield (on AVG Assets), %	4,27	3,94	3,64	3,51	3,52	3,78	3,78	3,78	3,78	3,78	3,78
Effective tax rate,%	27,83%	24,50%	31,38%	21,08%	15,81%	24,12%	24,12%	24,12%	24,12%	24,12%	24,12%
Reserves / GPW		114,6%	116,4%	121,8%	130,0%	118,9%	118,9%	118,9%	118,9%	118,9%	118,9%
Solvency Requirement, in % of NPW		47,67%	48,21%	48,07%	48,11%	48,02%	48,02%	48,02%	48,02%	48,02%	48,02%
Payout ratio, %	83,03	50,94	44,03	37,12	40,32	43,10	43,10	43,10	43,10	43,10	43,10

Source: VIG Annual reports, S&P Market Intelligent Platform

Table 17 Income statement projection

	historical anlaysis					explicit forecasting					mormalization
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	steady state
GPW (non life), thsd EUR	4618380	4560390	4599040	4751294	5089361	5216820	5347472	5481395	5618673	5759388	
GPW, growth %		-1%	1%	3%	7%	3%	3%	3%	3%	3%	3%
NPW retention rate based), thsd EUR	3892407	3793985	3831841	4325578	4655239	4520932	4634155	4750214	4869180	4991125	
NPE (S&P), , thsd EUR	3910017	3791322	3799702	4059031	4435172	4413361	4523891	4637188	4753323	4872367	
as % of GPW	85%	83%	83%	85%	87%	85%	85%	85%	85%	85%	
as % of GPW (assumed)	85%	83%	83%	83%	84%	84%	84%	84%	84%	84%	
Claims, thsd EUR		2495270	2534620	2904977	3158570	3037559	3113632	3191611	3271542	3353476	
Elaims ratio, %		66%	67%	72%	71%	69%	69%	69%	69%	69%	69%
Expeneses, , thsd EUR		1120460	1115840	745310	1012965	1104675	1132340	1160699	1189768	1219565	
Expense ratio		30%	29%	18%	23%	25%	25%	25%	25%	25%	25%
COR		**95%**	**96%**	**90%**	**94%**	**94%**	**94%**	**94%**	**94%**	**94%**	**94%**
Underwriting result, thsd EUR		**175592**	**149242**	**408744**	**263637**	**271128**	**277918**	**284878**	**292013**	**299326**	
Net Investment result, thsd EUR	267514	247528	117997	53831	322111	207252	194204	216274	265662	246457	
investment yield on non-life		5%	2%	1%	5%	3%	3%	3%	4%	3%	
Profit before tax, , thsd EUR	53580	309640	-41310	146601	159335	478380	472122	501153	557675	545783	
Taxes (effective rate), thsd EUR	14911	75866	-12963	27428	30166	115384	113875	120877	134510	131642	
Net profit (calc), thsd **EUR**	38669	233774	-28347	119173	129169	362996	358247	380275	423165	414141	
Net profit (S&P), thsd **EUR**	-10004	206921	-38364	119173	129169						
Net profit (report based), mln EUR				**119173**	**129169**	**132404**	**135720**	**139119**	**142603**	**146174**	**146174**

Source: VIG Annual reports, S&P Market Intelligent Platform

Figure 15 Business development per balance sheet unit

BUSINESS DEVELOPMENT PER BALANCE SHEET UNIT

in EUR '000	2017 Property/ Casualty	2017 Life	2017 Health	2017 Total	2016 Property/ Casualty	2016 Life	2016 Health	2016 Total
Operating result for direct business	266,076	319,894	42,570	628,540	233,942	332,086	58,734	624,762
Gross direct premiums written	5,089,361	3,650,199	458,208	9,197,768	4,751,294	3,746,570	412,484	8,910,348
Gross direct[1]	352,060	335,702	42,683	730,445	462,575	347,899	58,786	869,260
Underwriting result[2]	263,637			263,637	408,744			408,744
Financial result[2]	88,423			88,423	53,831			53,831
Direct reinsurance cessions	-85,984	-15,808	-113	-101,905	-228,633	-15,813	-52	-244,498
Operating result for indirect business	-30,315	559	52	-29,704	-70,231	9	122	-70,100
Gross indirect premiums written	173,860	14,346	66	188,272	127,321	13,118	181	140,620
Gross indirect	22,718	1,680	52	24,450	1,474	312	122	1,908
Indirect reinsurance cessions	-53,033	-1,121	0	-54,154	-71,705	-303	0	-72,008
Operating result for direct and indirect retention	235,761	320,453	42,622	598,836	163,711	332,095	58,856	554,662
Other non-underwriting income and expenses	-76,426	6,463	6	-69,957	-17,110	4,538	-316	-12,888
Expenses for profit related premium refunds	0	-85,770	-560	-86,330	0	-134,580	-460	-135,040
Result before taxes	159,335	241,146	42,068	442,549	146,601	202,053	58,080	406,734
Taxes	-30,166	-35,132	-4,660	-69,958	-27,428	-48,003	-10,313	-85,744
Result of the period	129,169	206,014	37,408	372,591	119,173	154,050	47,767	320,990

[1] Includes commissions of EUR 1,170,469,000 (EUR 1,107,341,000) for direct insurance business.

[2] A breakdown of the underwriting result was only performed for property and casualty insurance. Due to immateriality, investments were not transferred to the underwriting account in property and casualty insurance. Investment results were transferred in full to the underwriting account for the life and health insurance business.

Source: www.vig.com

Table 18 Balance sheet analysis and projection

	historical anlaysis				explicit forecasting					
thsd EUR	2014	2015	2016	2017	2018	2019	2020	2021	2022	TV
Assets,										
Investments (excl unit linked) (S&P), non-life	6632430	6904360	7451180	7727893	8133185	8559732	9008650	9481112	9978352	
growth , in %		4	8	4	5	5	5	5	5	5
Intangible assets	2369846	2079957	2054500	1970641	2272967	2392701	2518742	2651423	2791094	
as % in total assets	5	5	4	4	4	4	4	4	4	
Fixed assets (self used land and buildings) (total)	427384	434306	430906	429484	481620	506990	533697	561811	591406	
as % in total assets	1	1	1	1	1	1	1	1	1	
Other assets (in relation to all lines)	331307	349919	347819	389160	403404	424655	447024	470572	495361	
as % in total assets	1	1	1	1	1	1	1	1	1	
Cash and equivalents (in relation to all linesl)	781987	1103234	1589941	1497731	1545887	1627321	1713044	1803283	1898275	
as % in total assets	2	2	3	3	3	3	3	3	3	
Total assets	44 425 087	45 147 981	50 008 108	51 713 955	54 438 116	57 305 778	60 324 502	63 502 245	66 847 383	
growth, %		2	11	3	5	5	5	5	5	5
Liabilities										
Reserves (provisions) for P&C	5225207	5308810	5552608	5928932	6204133	6492109	6793451	7108781	7438747	
outstanding claims (as proxy for P&C provisions)	4488944	4603648	4815063	5141400	5380047	5629771	5891086	6164531	6450668	
Growth in outstanding claims, %		3	5	7	4,6	4,6	4,6	4,6	4,6	4,6
Debt (total firm)	919678	1280308	1265009	1458839						
Debt proxied through provisions share	172312	241491	240386	286705	343050	410469	491137	587660	703151	
growth in debt , in%		40,1	-0,5	19,3	19,7	19,7	19,7	19,7	19,7	
P&C reserves in total reserves (excl unit linked)	19	19	19	20	19,2	19,2	19,2	19,2	19,2	19,2
Total provisions (excl unit linked)	27888389	28145620	29220073	30168173	30971102	31795400	32641637	33510397	34402279	
Growth in total provisions, %		1	4	3	2,7	2,7	2,7	2,7	2,7	2,7

Other liabilites	1679355	1634579	4202585	4032102						
Capital & Reserves all	**2731555**	**2579634**	**2634924**	**2723982**	**2948754**	**3104087**	**3267603**	**3439732**	**3620928**	
Growth, %	6	6	5	5	5,4	5,4	5,4	5,4	5,4	5,4
Retained earnings all	2378849	2280499	1929339	2108029	2356362	2480489	2611155	2748704	2893498	
Growth, %	5	5	4	4	4,3	4,3	4,3	4,3	4,3	4,3
Shareholder funds all	5110404	4860133	4564263	4832011	5305116	5584576	5878757	6188435	6514427	
	12	11	9	9	9,7	9,7	9,7	9,7	9,7	9,7
Total Liability and equity	44 425 087	45 147 981	50 008 108	51 713 955	54 438 116	57 305 778	60 324 502	63 502 245	66 847 383	
Shareholder funds (attr to P&C)	957492	916715	867334	949632	1017125	1070705	1127107	1186480	1248981	

Source: Vienna Insurance Group 2018, Vienna Insurance Group 2016; S&P MI Database

Table 19 Solvency and dividend calculation on the whole firm level

	historical anlaysis				explicit forecasting					
SOLVENCY	2014	2015	2016	2017	2018	2019	2020	2021	2022	steady state
Solvency II requirement, bln EUR	1,81	3,24	3,41	3,48	3,61	3,74	3,87	4,01	4,16	
Solvency Capital (incl buffer), bln EUR	4,46	6,35	6,64	7,82	7,71	8,05	8,34	8,64	8,96	
S II Ratio, %	247	196	195	225	216	216	216	216	216	216
Dividends (total), thd EUR	181400	192545	88681	114281	134294	138759	143373	148140	153065	153065
Diviends (total growth), %		6,1	-53,9	28,9	17,5	3,3	3,3	3,3	3,3	3
Net income total, thd EUR	391360	110333	320990	372591	384979	397779	411004	424670	438789	438789
Net Income growth,%					3	3	3	3	3	3
Diviend payout ratio, %	46	175	28	31	35	35	35	35	35	35
Tangible book value (firm), thd EUR	2 913 581	2 425 103	3 656 757	4 073 308	4637469	5279768	6011026	6843565	7791412	
Solvency post dividend, bln EUR				7705719	7,57	7,91	8,20	8,50	8,80	
S II requirements growth, %			5,17	2,05	3,61	3,61	3,61	3,61	3,61	4

Source: Vienna Insurance Group 2016, Vienna Insurance Group 2018

Table 20 Additional performance indicators

	hisitorical analysis				explicit forecasting					
	2014	2015	2016	2017	2018	2019	2020	2021	2022	TV
KEY RATIOS										
NPE as % of NPW	100	99	99	99	100	100	100	100	100	100
Net investment return, thsd EUR	247 528	117 997	53 831	322 111	339 004	356 783	375 495	395 188	415 914	437 727
Reserves / GPW (non life), %	115	114	110	103	110	110	110	110	110	110
Investment (base) growth, %		4	8	4	5	5	5	5	5	5,2
RoAE, % (S&P)	7,43	(0,29)	6,06	6,39	4,88	4,88	4,88	4,88	4,88	4,88
ROE = NI / ShHFunds, %	7,66	2,16	6,28	7,29	5,85	5,85	5,85	5,85	5,85	5,85
RoTBV (ROATE), %	16,18	11,10	11,97	12,58	13,26	13,26	13,26	13,26	13,26	13,26

Source: S&P MI Platform, Vienna Insurance Group 2018, Vienna Insurance Group 2016

Table 21 Peer group choice

Institution Name	Insurance Sector	ROAA,%	ROAE,%	P/ B,%	Price/ TBV, %	Price/ EPS, x
ASR Nederland NV	Multiline	1,62	18,34	109,1	118,0	5,7
Helvetia Holding AG	Multiline	0,71	7,04	104,2	136,2	14,0
Vienna Insurance Group AG	**Multiline**	**0,73**	**6,39**	**71,1**	**123,6**	**11,5**
UNIQA Insurance Group AG	Multiline	0,53	5,20	85,2	97,3	16,8
SCOR SE	Multiline	0,66	4,43	101,6	174,5	22,2
Wüstenrot & Württembergische AG	Multiline	0,36	6,66	55,2	56,7	8,5
UnipolSai Assicurazioni SpA	Multiline	0,78	8,43	92,0	104,3	10,7
mean				0,88	115,8	12,8
median				0,92	118,0	11,5

Source: S&P MI Database

Table 22 Beta calculation

Beta calculation			
Peer short list	MKT CAP	BETA	adj BETA
ASR Nederland NV	5 741,5	0,79	0,86
AXA Belgium SA	4590,0	0,81	0,87
Helvetia Holding AG	5 099,1	0,67	0,78
Vienna Insurance Group AG	**3 020,8**	**0,80**	0,86
UNIQA Insurance Group AG	2 621,5	0,71	0,81
SCOR SE	6 570,2	0,46	0,64
Wüstenrot & Württembergische AG	1 865,4	0,61	0,74
UnipolSai Assicurazioni SpA	5 385,0	0,71	0,80
mean		**0,69**	**0,80**
median		**0,71**	**0,81**

Source: S&P MI Platform,

Table 23 COE Calculation

COE	STOXX® EUROPE 600 INDEX, ECB	VIG Report
Risk free rate	1,34%	1,34%
BETA (adj)	0,80	0,96
Market rate (industrial)	7,20%	
Market risk	5,86%	6,16%
Equity risk premium	4,66%	5,91%
CoE	6,00%	7,25%

Source: Vienna Insurance Group 2018;
https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/long_term_interest_rates/html/index.en.html
https://www.stoxx.com/document/Bookmarks/CurrentFactsheets/SXXGR.pdf (retrieved on 10.9. 2018).

Table 24 DDM non-life line value calculations

	historical analysis				explicit forecasting					
	2014	2015	2016	2017	2018	2019	2020	2021	2022	TV
NPE basis, 16%			649445	709628	688403	713196	723970	742101	760687	
Claims basis 26%			755294	821228	788763	806846	809710	829988	850775	
Min req. max {NPE; claims}			755294	821228	788763	806846	809710	829988	850775	
APE = 10% of single premims, 2017			75529	110621	110621	110621	110621	110621	110621	
*Capital buffer 25% of basis + APE adj.			207706	232962	224846	229367	230083	235152	240349	
Required cap.			**1038529**	**1164812**	**1124230**	**1146834**	**1150414**	**1175762**	**1201745**	
Net Income P&C			119 173	129 169	132 404	135 720	139 119	142 603	146 174	
Share holders equity, BoP (attributable to P&C)			867 334	1 038 529	1 164 812	1 124 230	1 146 834	1 150 414	1 175 762	
Net Income P&C			119 173	129 169	132 404	135 720	139 119	142 603	146 174	
Shareholders equity EoP (attributable to P&C)			986 507	1 167 698	1 297 216	1 259 950	1 285 953	1 293 017	1 321 936	
Dividend capacity				**2 886**	**172 986**	**113 116**	**135 539**	**117 255**	**120 191**	**120 191**

Source: Vienna Insurance Group 2018, Vienna Insurance Group 2016, S&P MI Platform

Table 25 Present value of non -life branch calculation

	explicit forecasting					normalization
	2018	2019	2020	2021	2022	steady state
Discounting and Terminal Value						
Period	1	2	3	4	5	5
Discount rate,%	7,25%	7,25%	7,25%	7,25%	7,25%	5,25%
Dividends, thd EUR	172986	113116	135539	117255	120191	120191
Terminal value after explicit, thd EUR						2287791
Present value, thd EUR	161287	98333	109858	88610	84686	1611970
Value, thd EUR	**2154744**					

Source: own calculations based on previous calculations

Table 26 Terminal value sensitivity on main factors growth and discount rate, in thsd EUR.

1611970	6,00%	6,75%	7,25%	8,00%	8,50%
0,5%	1539754	1354983	1254614	1129153	1058581
1,0%	1693729	1472808	1354983	1209806	1129153
2,0%	2117161	1782873	1613075	1411441	1302868
2,5%	2419613	1992622	1782873	1539754	1411441
3,0%	2822882	2258305	1992622	1693729	1539754
3,3%	3079507	2419613	2117161	1782873	1613075

Source: onw calculations

Table 27 MCEV Calculation

	2017
Free Surplus	1571006
Required Capital	308581
ANAV	1879587
PVFP (stochastic)	3589857
FCRC	
CRNHR	
- Net Risk Margin	-964859
VIF	2624998
MCEV	6214855

Source: Vienna Insurance Group , 2018a

Table 28 WEM value calculation. Thsd EUR

WEM Multiple from fundamentals	
Equity 2017	6158484
Excess Capital	2633862
SCR Group	3524622
Equity net of ExC	3524622
COE	7,25%
LT growth	2%
LT RoE adj.	11%
WEM P/BV	1,63
Value	7883281,2
Value per share, EUR	61,59

Source: own calculations Vienna Insurance Group 2018

Table 29 RIM method value calculation

	explicit forecasting					
RIM (ECM)	2018	2019	2020	2021	2022	TV
Equity BoP, thsd EUR	1017125	1103342	1191718	1282307	1375165	
Adjusted Net Income,thsd EUR	132404	135720	139119	142603	146174	
(-) dividends, thsd EUR	46187	47344	48530	49745	50991	
Equity EoP, thsd EUR	1103342	1191718	1282307	1375165	1470349	
Excess return, thsd EUR	58626	55688	52676	49590	46425	46425
Discount factor	0,9324	0,8693	0,8105	0,7557	0,7046	0,7046
Present Value, thsd EUR	54661	48410	42695	37475	32711	883688
Total Present Value, thsd EUR	1099641					
with ExC, thsd EUR	3733503					
with MCEV, thsd EUR	**8238088**					
Value per share	**64**					
RoE	13%	12%	12%	11%	11%	
COE	7,25%					

Source: own calculations

Table 30 Valuation by multiples

Institution Name	Insurance Sector	ROAA,%	ROAE,%	P/ B,%	Price/ TBV, %	Price/ EPS, x
ASR Nederland NV	Multiline	1,62	18,34	109,1	118,0	5,7
Helvetia Holding AG	Multiline	0,71	7,04	104,2	136,2	14,0
Vienna Insurance Group AG	**Multiline**	**0,73**	**6,39**	**71,1**	**123,6**	**11,5**
UNIQA Insurance Group AG	Multiline	0,53	5,20	85,2	97,3	16,8
SCOR SE	Multiline	0,66	4,43	101,6	174,5	22,2
Wüstenrot & Württembergische AG	Multiline	0,36	6,66	55,2	56,7	8,5
UnipolSai Assicurazioni SpA	Multiline	0,78	8,43	92,0	104,3	10,7
mean				0,88	115,8	12,8
median				0,92	118,0	11,5
Value, thsd EUR (mean)				4269283,74		4763931,19
Value, thsd EUR (median)				4447272,84		4300703,68
Market price Check, EUR	24,58			33,35		37,22
(28.9.2018)				34,74		33,60

Source: S&P MI Platform, (https://www.bloomberg.com/quote/VIG:AV; own calculations