THESIS

Profit & Loss Attribution of Insurers
Usefulness with Economic Value Measurement

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1. Introduction

This thesis aims to explore the possible uses of a profit and loss (P&L) attribution for an insurance company, when an economic value measurement is applied to value insurance related obligations. For this purpose, a comprehensive description is given on the content and preparation of P&L attributions, as well as the theoretical background underlying the valuations.

The ultimate goal of the P&L attribution is action. The usefulness depends on management making good decisions, on analysts maintaining a sound modelling environment, on investors and regulators understanding more about a company, and more.

The following chapters explore how to prepare a P&L attribution to support these actions. They describe when to increase calculation detail, how to compare results with P&L attributions over different time periods and how to avoid common pitfalls. The description also explicitly considers aspects of non-life portfolios.

Explanations are intended to be as practical as possible. Additionally, some practical challenges are also highlighted, which might impair the usefulness of a P&L attribution.

To verify the explanations, a survey about the current use of economic value measurement reports in Hungary is described.

The terminology applied follows the naming conventions of Solvency II as presented in the SII Directive [2009], in order to make concepts described easier for the reader.

The academic literature with regard to the usefulness of P&L attribution is rather limited. Most publications address management decisions, particularly strategic decision making. Therefore, the scope of references had to be extended to include non-insurance related areas, like management controlling theory and management information systems. By drawing a comparison to these areas, some important features and uses of P&L attribution report are described. Also, since the consideration of non-life portfolios has just begun to gain academic attention, therefore available sources are rather scarce.
Nonetheless, there are limitations also on the scope of the thesis.
- Features related to non-life portfolios are described only to the detail necessary to give a complete picture on the P&L attribution
- Valuation of insurance portfolios is not presented in detail unless the calculation of the P&L attribution makes it necessary
- A shareholder perspective to valuation is taken in the description, which means that only ‘gain at issue’ frameworks are considered. IFRS plans to apply a ‘no gain at issue’ approach in the valuation of insurance obligations, which might have an effect on the P&L attribution.

The explanation follow the below structure:
- Chapter 2 provides the theoretical background on economic value measurement
- Chapter 3 explains the detailed structure of a P&L attribution
- Chapter 4 explores the usefulness of P&L attribution from both theoretical and practical viewpoint
- Chapter 5 describes the outcome of a survey on the current use of P&L attribution in Hungary
- Chapter 6 points out practical challenges in preparing a P&L attribution
- Chapter 7 gives a summary on the above and further outlook on the topic

I would like to thank Judit Kovács, advisor for the thesis, for her support and content related suggestions. She is my manager too and during the past years we had several discussions about P&L attribution reports which helped to clarify many confusing practical problems related to the preparation and use of such reports. I am grateful to her for support in both my academic and professional roles.

I would like to thank Prof. Dr. Erzsébet Kovács for her support in conducting the survey. She helped in collecting the results (which keep responders anonymous) and also encouraged participants to submit surveys. She also contributed in suggesting the comparison between different time periods (the ‘time dimension’) in the P&L attribution.

Ágnes Kathi contributed with IFRS related content to the thesis, especially with the fair value related descriptions.

Lasha Shaw-Korchynski helped with proof reading the English text. I am grateful for her corrections, nonetheless I take full credit for all remaining mistakes.
I would like to thank also to all the participants of the survey; who took their time to support the thesis with their responses. And last but not least I would like to thank all my colleagues, with whom I had the chance to discuss issues related to P&L attributions in the past years. In particular, I am grateful to colleagues, who pointed out the pitfalls that hinder the P&L attribution’s practical usefulness as a tool. Without their inspiration this thesis would probably not have come to existence.
2. Theoretical Background

The balance sheet of a company gives a snapshot of its financial position. It shows the assets and liabilities of an enterprise for a given valuation date. The equity is the value that is attributed to shareholders. Equity is also called net asset value (NAV) because it is the excess of assets over liabilities as it can be seen below.

![Simple Balance Sheet](image)

The profit and loss (P&L) attribution connects two balance sheets. “Profits and losses are reflected on the balance sheet as retained earnings and are part of shareholders’ equity.” (de Weert [2011] p. 18) It is a list of profit and loss sources, that contribute to the financial result of a period.

2.1. Characteristics of Insurance Company Balance Sheets

As any other company, insurers prepare balance sheets and P&L attribution statements too. What makes it different for them is the nature of their business. “The balance sheet of an insurance company is completely liability driven; in other words, client activity ... does not take place at the asset side of the balance sheet.” (ibid. p. 18) This means that customers of non-financial companies are typically debtors (i.e. the customer owes the non-financial company money), whereas a substantial part of the customer base of banks and insurers has a creditor relationship (i.e. the financial company owes the customer money). (ibid. p. 17)
In the case of insurance companies, clients pay the price of the insurance policy (the premium) in advance and it takes a long time until all obligations are settled. Until that point, the obligations are reflected as liabilities on the company’s balance sheet. The below chart depicts the balance sheet of a typical insurance entity. Technical provisions are obligations to clients that have to be settled in the future.

Insurers have long term obligations. The term of a life insurance policy can be more than 20 years. And although general insurance contracts tend to have a shorter term (typically one year), it may take years until all claims are reported and can be settled. This means that considerable amount of reserves has to be set up to meet future obligations. Accordingly, the change in the technical provisions has a significant impact on the P&L attribution of insurance entities.

In the next two sections the approaches used to value balance sheet items related to insurance obligations are presented.

### 2.2. Traditional Approach to Valuation

The approaches used to value balance sheet items related to insurance obligations have been grouped in two categories: traditional approach and economic value measurement. This split is not standard in academic literature to my best knowledge, however it has particular importance with regard to the design and content of the profit and loss attribution.
The Traditional approach has been and still is widely used for financial reporting. It is a prudent, conservative way of presenting the financial position in the balance sheet. It has the following characteristics with regard to the valuation of balance sheet items related to insurance obligations:

- Use of risk-adjusted cash flows. The projection of future cash flows is based on conservative assumptions. For example for calculating the probability of future death claims, a population mortality table would be used even if insured clients tend to be healthier. Assumptions are rarely updated after the initial recognition of an insurance obligation.
- Flat discount rate. To account for the time value of money, the projected cash flows are discounted with a flat interest rate, that is equal to the guaranteed rate. This rate is typically lower than market interest rates.
- Allowance for future profits is restricted. Profits expected from the insurance portfolio can only be recognized on the balance sheet as deferred acquisition costs, when they offset the high initial spending related to previously sold policies.
- Allowance for future losses is obligatory. If the technical reserves were insufficient to settle all expected claims, additional reserves would have to be set up. This might be the case if the expected expenses related to servicing a portfolio become higher than the expense charges taken from the clients.

In Hungary, statutory reporting rules prescribe the use of the Traditional approach.

### 2.3. Economic Value Measurement

Economic value measurement focuses on how much an item is worth in economic terms. ‘Economic’ in this respect means that allowance is made for the time value of money and the cost of taking on risks.

The characteristics of economic value measurement depend on the choice of how interest rates are set. Below the features of the so called risk-free valuation are listed with regard to the valuation of balance sheet items related to insurance obligations:

- Use of best estimate cash flows. Projection of future cash flows is based on unbiased assumptions, which reflect all relevant information. For example for calculating the probability of future death claims, a population mortality table would be adjusted to reflect that insured clients tend to be healthier or even a portfolio specific mortality table would be constructed. Assumptions are frequently updated to include new information.
• Separate allowance for risks. As cash flows reflect best estimate assumptions, there is an additional allowance for the risks arising from the uncertainty in the expected cash flows.

• Discount rates are risk-free. They are based on financial instruments that are assumed to be the most secure and therefore neatly risk-free (e.g. government bonds).

• Allowance for future profits and losses. Use of best estimate assumptions permits both expected profits and losses arising from the already acquired insurance portfolio.

The risk-free variant of economic value measurement is applied by Market Consistent Embedded Value (CFO Forum [2009]) and Solvency II (SII Directive [2009]). Additionally, the International Financial Reporting Standards (IFRS) are also planned to require economic value measurement for insurance contracts (IASB [2013]).

Besides the above explained risk-free type, there exists also a so called real-world variant of economic value measurement of insurance obligations, which is applied e.g. by the European Embedded Value (CFO Forum [2004]). Although this type will not be discussed in this paper, the profit and loss attribution itself and its usefulness are very similar with both variants.

2.4. Exit Value vs. Going Concern Value

The economic value of an item is different for the prospective buyer compared to the current owner. The viewpoint of the third party is called ‘exit value’. It is the price that would be received to sell an asset or paid to transfer a liability. Exit value is a non-entity specific measurement, meaning similar assets and liabilities have the same value – regardless of which entity holds them.

The value according to the owner’s perspective is the ‘going concern value’ or ‘fulfillment value’. The owner of the item is interested in the expected present value of the revenues earned on an asset or the cost of fulfilling an obligation. Going concern value is entity specific, that means similar assets and liabilities can be valued differently, in line with specific features and expectations of the entity owning the item. This assumes that the proprietor of the entity plans to continue the entity’s operations. In other words, going concern value refers to the “situation where the entity is able to proceed all its activities in the foreseeable future unforced by liquidation procedures” (CEA and Groupe Consultatif [2007], p. 29). If the owner is rather interested in selling or transferring the entity, then the assessment will be in accordance with the exit value.
Exit value is preferred for financial reporting purposes. “The purpose of any reporting basis is to provide investors with comparable company information.” (Larry et al. [2009], p. 8) The perspective of the market (exit value) is more objective than the going concern value (which reflects the judgement of the owner).

Most balance sheet items are reported on exit value, even for insurers. E.g. financial assets like bonds and equities are traded on regulated markets and have a market price. However, there is no appropriate market for insurance obligations, i.e. market price is not observable in most of the cases. The valuation of insurance liabilities therefore has to employ entity specific information, e.g. assumptions on the behavior of policyholders such as lapses.

When it comes to valuation of insurance liabilities, reporting standards employing economic value measurement are not uniform on the choice of exit value or going concern value.

Both European and Market Consistent Embedded Value permit a going concern approach. With these standards, the equity of the company (or ‘embedded value’) is “the value of shareholders’ interests … in the earnings distributable … after sufficient allowance for … risks.” (CFO Forum [2004], p. 2 and CFO Forum [2009], p. 3)

Solvency II requires an exit value to be calculated for both assets and liabilities: “Assets shall be valued at the amount for which they could be exchanged between knowledgeable willing parties in an arm’s length transaction”. (SII Directive [2009], art. 75 at 1) Value of insurance obligations (i.e. technical provisions) “… shall correspond to the current amount insurance … undertakings would have to pay if they were to transfer their insurance … obligations immediately to another insurance … undertaking.” (ibid. art. 76 at 2)

The International Financial Reporting Standards (IFRS) require the use of ‘fair value’ when measuring balance sheet items. The general definition of fair value is “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.” (IASB [2011], par. 9) According to the general definition, fair value is a market-based, not an entity-specific measurement. (ibid. par. 2)

However, IFRS recognizes that entity specific information is needed for the valuation of insurance obligations. A new standard on the measurement of insurance obligations is currently being developed. The most recent draft version of this new standard requires companies “to measure an
insurance contract ... using a current value approach that incorporates all of the available information in a way that is consistent with observable market information; and ...to present insurance contract revenue ... in an amount that reflects the consideration to which the entity expects to be entitled ... " (IASB [2013], par. 2) According to this definition, fair value of insurance obligations is a going concern value, representing the expectations of the entity owning the liability. However, expectations have to be consistent with observable market information. In other words, when the time value of money is allowed for, discount rates should be consistent with financial markets.

2.5. Basic Structure and Naming Convention

A P&L attribution explains the drivers behind the change of Net Asset Value during the period. It is of course dependent on the valuation standard: if an economic value measurement is applied for insurance obligations, the main drivers will be the ones shown below:

- Opening Net Asset Value
- Corrections and model changes
- New business value
- Expected business contribution
- Experience variances
- Assumption changes
- Other movements
- Closing Net Asset Value

The following chapter will give a detailed explanation on the content of the above main drivers.

The profit and loss attribution has various names: the European Embedded Value principles call it ‘analysis of return on EV’. (CFO Forum [2004], p. 14) In the Market Consistent Embedded Value principles it is referred to as ‘analysis of MCEV earnings’. (CFO Forum [2009], p. 16) The term ‘statement of profit or loss and other comprehensive income’ is currently applied in IFRS. (IASB [2013], p. 28) The terminology in the thesis (profit and loss attribution) follows the naming convention of Solvency II. (SII Directive [2009], art. 123)
3. Detailed Structure of a Profit and Loss Attribution

This chapter gives a detailed description on the structure of a profit and loss (P&L) attribution of an insurance company, if an economic value measurement is applied to insurance related obligations. The explanation is illustrated with results of a hypothetical Life insurance company.

3.1. First Dimension – Drivers of Change in Company Total Equity

A P&L attribution links two balance sheets: it explains the drivers of change in net asset value (i.e. equity) from the beginning of period (BoP) to the end of period (EoP). The following is a typical grouping of these drivers, based on the MCEV Principles (CFO Forum [2009], p. 28).

- Opening Net Asset Value
- Corrections and model changes
- New business value
- Expected business contribution
- Experience variances
- Assumption changes
- Other movements
- Closing Net Asset Value

The following part of this section explains in detail each category and explores how they can be broken down into more granular sub categories. This split of the drivers of change in company total equity are part of the curriculum of any actuarial science training program, however they are presented here to give a complete picture of the topic. In addition, the explanation is enriched with my experience in analyzing P&L attribution reports.

Opening Net Asset Value

This is the excess of assets over liabilities at beginning of period (BoP), which is equal to the closing NAV of the previous period’s P&L attribution.
3.1.1. Corrections and model changes

Calculation of the Net Asset Value might be different in the beginning of the period than it is at the end. If it turns out that there was an error in the calculation in the previous period, then a correction is made. If the calculation model has been enhanced to be more precise, then a model change happens. The effect of these changes on NAV is presented here.

Generally, corrections have a negative message (something has been done wrong previously) and model changes are rather positive (the calculation has been enhanced). However, it is not always a clear if an amendment in the calculation model is indeed a model change or rather a correction. If the new model gives significantly different results, then the change might be rather categorized as correction of the previously used simplified approach.

3.1.2. New Business Value

New business value includes the NAV effect of contracts that have been sold during the period, since they were not included in the opening net asset value as the balance sheet includes the value of insurance contracts in-force at the valuation date.

MCEV principle 10 gives the following definition: “New business is defined 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 includes the value of expected renewals on those new contracts and expected future contractual alterations to those new contracts. ... The value of new business should reflect the additional value to shareholders created through the activity of writing new business.” (CFO Forum [2009], p. 7)

The portfolio of in-force policies at beginning of period is called existing business. The closing portfolio of in-force contracts includes both end of period value of existing business and the end of period value of new business.

New business value can either exclude or include the experiences and assumption changes between the time of initial recognition of the contracts and the end of period. In other words, valuation can be either point of sale (PoS) or end of period (EoP), respectively. If new business value is measured at
point of sale, then the changes in value of new contracts between PoS and EoP will be included along with similar changes of existing business value.

The measurement of new business can be further categorized in so called gain at issue (GAI) and no gain at issue (NGAI) types. Under gain at issue, the enterprise is able to recognize “an immediate gain for any premiums expected to be received during the life of a contract that are over and above those implicitly required by the risk margin associated with the business written.” (Larry et al. [2009], p. 6) With no gain at issue valuation, there is no possibility for the insurer to recognize such gains.

Gain at issue (GAI) valuation is applied by the European Embedded Value, Market Consistent Embedded Value and Solvency II. The International Financial Reporting Standards are planned to adopt the no gain at issue (NGAI) valuation for initial recognition of insurance contracts where the so called contractual service margin offsets any gain at issue (IASB [2013], p. 17 and 19-20). The explanations in the thesis follow the gain at issue (GAI) valuation.

As mentioned in MCEV Principle 10 above, new business value includes in some cases increases to existing contracts during the reporting period. Typical examples for this would be one time premium payments (so called top-ups) by clients or renewals of contracts that the assumptions do not allow for.

3.1.3. Expected Business Contribution

Expected business contribution is the change in value due to moving forward the valuation date of the balance sheet to the end of period. It is ‘expected’ because the shift in time is carried out without allowing for the effect of any new information regarding the portfolio. It answers the question: how the balance sheet would look at the end of period if everything happens according to the assumptions.

If new business is valued at point of sale, then the expected contribution of those policies between PoS and EoP is also included here.
Expected contribution can be broken down into:

- **Expected interest**: the change due to the time value of money, also called ‘unwinding of discount’. Projected future cash flows are discounted and their present value depends on the valuation date. It is calculated not just for liabilities, but also for assets.

- **Expected release of margins**: Risk margin is the allowance for risks arising from the uncertainty in the expected cash flows. As uncertainty up until the end of period is eliminated, risk margin decreases accordingly.

Expected interest can be calculated as opening value times the risk free forward rate. If the time period between BoP and EoP is modelled in multiple time steps (e.g. when models calculate in monthly steps whereas the time period is one year), then expected interest is the sum of opening value times the risk free forward rate for each modelling period. This can be expressed with the following formula:

\[
\text{Expected interest} = \sum_{t=0}^{T-1} (V_t \times RFR_{t+1}^{fwd})
\]

where
- \( T = \) end of period (0 denotes beginning of period)
- \( t = \) valuation date
- \( V_t = \) projected value of the balance sheet item at time \( t \)
- \( RFR_{t+1}^{fwd} = \) risk free forward rate between \( t-1 \) and \( t \)

\( V_t \) above refers to balance sheet items that are calculated as present values. Typically these are modelled insurance obligations measured with economic value or financial assets.

Expected release of margins can be calculated with the following formula:

\[
\text{Expected release of margins} = \sum_{t=0}^{T-1} (RM_{t+1} - RM_t \times (1 + RFR_t^{fwd}))
\]

where
- \( T = \) end of period (0 denotes beginning of period)
- \( t = \) valuation date
- \( RM_t = \) projected risk margin at time \( t \)
- \( RFR_t^{fwd} = \) risk free forward rate between \( t-1 \) and \( t \)
Solvency II prescribes the use of cost-of-capital approach to determine the value of the risk margin. (SII Directive [2009], art. 77 at 5) If a cost-of-capital approach is used for measuring the risk margin, then the formula on expected release of margins can also be expressed in the following way:

\[
\text{Expected release of margins} = \sum_{t=0}^{T-1} (EC_t \times CoC)
\]

where

- \( EC_t \) = economic capital at time \( t \)
- \( CoC \) = cost-of-capital rate

Economic capital is the amount of capital required to ensure that the liabilities of the unit can be settled with an appropriately high probability (e.g. 99.5% on a one year time horizon).

### 3.1.4. Experience Variances

The effect of experiences differing from assumptions during the period is presented here.

There are two types of experience variances from calculation perspective:

- **Difference only in current period cash flows (CF only).** This is the case if the only difference compared to expectations is in the cash flows (profits and losses) of current period. End of period value of the balance sheet items remain unchanged, i.e. there is no effect on the projected future after end of period.

- **Difference both in current period cash flows and end of period value (CF & EoP).** Experienced cash flows are different from expected ones for current period and value of balance sheet items at end of period is also affected by the experience, i.e. there is a change in the projected future too.

Experience variances can be broken down in line with the categorization of risks. The following subgroups are based on the grouping of risks into sub-modules in Solvency II Standard Formula (SII Implementing Measures [2015], Chapter V.)

- Mortality variance
- Morbidity variance
- Lapse variance
- Non-life claim variance
- Expense variance
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- Interest rate variance
- Equity variance
- Counterparty default variance
- Other explained market variance
- Other explained non-market variance
- Unexplained variance

Mortality variance shows the effect of mortality and longevity risk related experiences, i.e. deviation from expected mortality of insureds. It is a CF & EoP variance, i.e. it may impact both the cash flows of current period and the end of period NAV.

Morbidity variance includes the effect of disability-morbidity risk related experiences, i.e. deviation from expected disability-morbidity rates of insureds. Although these risks might influence the end of period value of obligations (e.g. in case of accidental death), in many cases it is a reasonable simplification to present here only deviations in current period cash flows (CF only).

Lapse variance allows for deviations in option exercise rates of policyholders for options like surrender or renewal of the contract or decrease in insurance cover. These typically affect both current period cash flows and closing value of the obligation (CF & EoP).

Non-life claim variance presents the effect of deviation from expected claim development in case of non-life portfolios. It is connected with premium and reserve risk: claims related to both premium written in current period (premium risk) and premium written in prior periods (reserve risk) is included here. It is a CF & EoP type variance.

Expense variance includes the effect of different expense and commission spending in current period compared to the assumptions. It is a CF only variance.

Interest rate variance shows the effect of different interest rate earned on bond portfolios in current period compared to the assumed risk free level. Such deviations can impact the closing value of obligations e.g. through the change in fund value of unit linked life portfolios and through profit sharing in traditional life portfolios. Non-life portfolios might be affected via different interest earned on assets backing non-profit sharing claim reserves. This is a CF & EoP type variance.
Equity variance allows for the effect of different returns achieved on equity asset portfolios in current period compared to the assumed risk free level. Similarly to interest rate variance, it can impact the closing value of obligations e.g. via the change in fund value of unit linked life portfolios. Also current period cash flows might be impacted via the effect of changing fund value on benefit payments and charges, i.e. it is a CF & EoP type variance.

Counterparty default variance includes change in NAV due to different default experience compared to assumed levels. It relates to claims of the insurance company towards its counterparties, e.g. due to risk mitigating contracts like reinsurance, deposits at banks or receivables from intermediaries. It is a CF only variance.

Other explained market variance covers all impacts of changes in expected financial market behavior, that have not been allowed for in the above categories. E.g. changes related to currency risk, property risk, spread risk can be included here. It might impact both current period cash flows and closing value of assets and obligations, therefore it is a CF & EoP type variance.

Other explained non-market variance presents the effect of variances when they have a known source, when they are connected to insurance related assets or liabilities and cannot be categorized in the above groups. For example the one-off impact of legislation changes might be included here. It is a CF & EoP type variance.

Unexplained variance is a balancing item. It covers all changes in value of NAV, that cannot be allocated to any other line above, but that are due to variances on assets and liabilities related to insurance obligations. It is a CF & EoP type variance as both current period cash flows and end of period asset and liability values might be affected by these changes.

3.1.5. Assumption Changes

The effect of change in assumptions underlying the valuation is presented here.

From calculation perspective, assumption changes affect only the end of period value of balance sheet items, they have no impact on cash flows of current period. In other words, they are ‘EoP only’ type changes.
Changes in assumptions can be categorized in the same way as experience variances:

- Mortality assumption change
- Morbidity assumption change
- Lapse assumption change
- Non-life claim assumption change
- Expense assumption change
- Interest rate assumption change
- Equity assumption change
- Counterparty default assumption change
- Other explained market assumption change
- Other explained non-market assumption change

The content of each category can be derived from the explanation given for experience variances. There is no category for unexplained assumption changes as it should be possible to allocate all changes in one of the above categories.

3.1.6. Other Movements

The categories explained above account just for a part of the total change in NAV from beginning of period to the end of period. They include all effects of insurance obligation related balance sheet items like insurance liabilities and assets backing insurance liabilities. However, there are also other drivers that are not related to insurance obligations. They are presented here.

A possible split of these items could be in:

- Capital movements, and
- Explained other changes

Capital movements include the effect of dividend payments and capital injections.

Explained other changes include the difference in EoP and BoP value of assets and liabilities which are not related to insurance obligations. Typically this is an EoP only type change.
3.2. Second Dimension - Splitting up the Total Company Movement

Each driver of change in company total equity (first dimension) can be further divided by a cross company split or a technical split.

A cross company split of the movements would show change in NAV by different insurance portfolio aggregation levels. The change could be broken down to e.g. lines of business, then to product categories, products and sub products.

A technical split of movements in company total equity could be the following:

- Assets backing insurance liabilities
- Other assets
- Liabilities related to insurance obligations
- Other liabilities
- Asset cash flows
- Liability cash flows

The first four categories include all balance sheet items of an insurance company.

The two cash flow categories can be used to show separately the cash flows that happen during the period. They are introduced in the P&L attribution on a dedicated additional line called ‘expected cash flows’, which is included in expected business contribution. The sum of changes presented on this line adds up to zero: it is simply a rearrangement of expected cash flow of current period from both asset and liability to the respective cash flow column.

The total impact of line ‘Expected cash flows’ is zero. Liabilities increase or decrease according to the assumptions, which is relocated to column liability cash flows with opposite sign. The same is true for assets and asset cash flows. After the rearrangement, column Assets and Liabilities include the expected end of period value of both assets and liabilities related to insurance obligations. Without the rearrangement, all cash flows which are expected to happen during the period would be still included in column Asset and Liability.

Expected liability cash flow has been included in the opening liability value but is not in the closing value – it is the one expected for the current period. Modelled in and outflows of money can be categorized in premium income, claim payment and expenses.
The liability cash flows of the period are effectively changing the value of assets: if premium is paid in, this will increase both the closing value of assets and closing value of liabilities. There is another technical line called ‘Transfer cash flows’, which serves only to transfer the liability cash flow movement from column ‘Liability cash flows’ to column ‘Assets’. Accordingly, the closing value of ‘Liability cash flows’ column will be zero.

Expected asset cash flows are needed for the very same purpose as their liability counterpart: to enable showing the changes in expected closing value of assets in the asset column. However, cash flows on assets are always zero-sum games: only the form of assets change, not the value. If there is an interest payment on a bond asset, then the projected asset cash flow will include the value of the paid cash, which is equal to the decrease in bond asset value. This means that the figure in the asset cash flow column is offset with an impact equal in amount but with different sign in column ‘Assets’.

Due to the above, it is not useful to show a separate asset cash flow column, but rather include that impact in column ‘Assets’.

**3.3. Third Dimension – Comparing Different Periods**

A P&L attribution can be enriched with results of other periods and plans for comparison. For example it helps to include the P&L attribution of the previous period, forecasted results of current period, forecasted results of the following period and the budgeted results for the current period and the next period.

**3.4. Fourth Dimension – Splitting Internal and External Effects**

It is useful to split drivers behind change in NAV into company internal and company external factors. Company external factors are effects attributable to the market environment whereas company internal ones are attributable to the management of the enterprise.

Diers et al. [2012] present such a split for the P&L attribution of a German non-life insurer. They separate the experience variances into internal and external factors for the non-life claim variance (loss ratio), lapse variance (cancellation rate) and expense variance (claim settlement costs). (Diers et al. [2012] p. 333-334)
The separation requires that the market average rates for the relevant portfolio are available. Maybe this is the case for some non-Life portfolios in Germany. However comparable, reliable and official market data is not available to my best knowledge in Hungary for non-life portfolios, not to mention Life insurance portfolios.

Because of the above, this split is presented in the thesis as rather an interesting theoretical consideration with less practical relevance currently.
4. Usefulness with Economic Value Measurement

This chapter explores the usefulness of a profit and loss attribution for an insurance company, if economic value measurement is applied to value balance sheet items related to insurance obligations.

4.1. Supports Management in Decision Making

The P&L attribution can be utilized to support management in decision making. The below subsections explore the possible uses, first from a theoretical perspective, continuing with the applicability in the management of life insurance and in the management of non-life insurance businesses. After that it is discussed, whether economic value measurement is more value relevant than the traditional approach – the answer is important for deciding on which performance targets to set for an insurance company.

Later on, important considerations regarding the design and preparation of a P&L attribution are explained with regards to the detail of split in NAV impacts and quality of information provided.

Finally, limitations on the usefulness are discussed.

4.1.1. Theoretical Background

According to Laudon and Laudon [2010], decisions can be categorized in three types: unstructured, structured and semi-structured. “Unstructured decisions are those in which the decision maker must provide judgement, evaluation, and insight to solve a problem.” (Laudon and Laudon [2010], p. 478)

“Structured decisions, by contrast, are repetitive and routine”. (ibid. p. 478) Accordingly, a P&L attribution can rather support unstructured and semi-structured decisions. “In general, structured decisions are more relevant at lower organizational levels, whereas unstructured problems are more common at higher levels of the firm.” (ibid. p. 478)

Based on the categorization of management information systems presented in Laudon and Laudon [2010], the P&L attribution can be mainly an input for executive support systems. “Executive support systems (ESS) help senior management make ... decisions” that address “strategy issues and long-term trends, both in the firm and in the external environment“. (Laudon and Laudon [2010], p. 81)
“ESS address non-routine decisions requiring judgement, evaluation, an insight because there is no agreed-on procedure for arriving at a solution. ESS present graphs and data from many sources through an interface that is easy for senior managers to use.” (ibid. p. 81)

Anthony and Govindarajan [2007] give a detailed description about how to measure and control assets employed by a generic (i.e. not specifically insurance related) company. They use the term ‘economic reports’ to refer to analysis based on economic value added (EVA) and return on investment (ROI). Kraus [2013] finds that EVA is conceptually very similar to the P&L attribution, i.e. it is worth to consider the findings of Anthony and Govindarajan. They explain that ‘economic reports’ (like the P&L attribution) have the following purpose:
- “To provide information that is useful in making sound decisions about assets employed and to motivate managers to make these sound decisions that are in the best interest of the company.
- To measure the performance of a business unit as an economic entity.” (Anthony and Govindarajan [2007], p. 271)

Anthony and Govindarajan find – for a generic company – that “economic reports are a diagnostic instrument. They indicate whether the current strategies of the business unit are satisfactory and, if not, whether a decision should be made to do something about the business unit – expand it, shrink it, change its directions or sell it.” (ibid. p. 289) Accordingly, for a generic company “management reports are prepared monthly or quarterly, whereas economic performance reports are prepared at irregular intervals, usually once every several years.” (ibid. p. 289)

The above can be translated into companies operating in the insurance business. The P&L attribution is an economic report too, therefore it can be used to make strategic decisions about capital allocation. For this purpose it needs to be prepared rather infrequently. However, for insurance companies, the P&L attribution can be used as a management report too, making it worth to prepare it rather frequently. This will be further explored in section 4.1.2 and 4.1.3.

One possible theoretical application field for the P&L attribution is the balanced scorecard. The balanced scorecard method is a “methodology for understanding the really important information needed by a firm’s executives”. (Laudon and Laudon [2010], p. 494) Some of the key performance indicators, which are the essence of a balanced scorecard, can be calculated with the help of the P&L attribution.
4.1.2. Applicability in Theory for Managing a Life Insurance Company

Management reports of insurance companies can be based on valuations using the traditional valuation approach or economic value measurement. As the statutory reporting basis for insurance companies is often the traditional approach (as e.g. in Hungary), it is straightforward to rely on the information gained from those calculations. However, as the profitability measures calculated with the traditional approach “typically focus on profits realized on existing business, they do not permit management to take credit for future profits that can be expected to be achieved on that block of business.” (Klumpes [2005], p. 171) Especially in long term contracting decision environments like life insurance, “the reliability of single-period accounting based measures ... is therefore likely to be problematic, both in capturing uncertain cash flows and by failing to incorporate an appropriate risk factor into the determination of the cost of capital to be allocated to the business line.” (ibid. p. 171) Therefore, management reports in life insurance business might be rather based on valuations using economic value measurement. Consequently, the profit and loss attribution might be prepared quarterly or even monthly.

4.1.3. Applicability in Theory for Managing a Non-Life Insurance Company

It is a question whether management of companies operating in non-life insurance can make use of reports based on economic value measurement. Popular performance metrics applied by non-life insurance companies are economic value added (EVA; Malmi and Ikähaimo [2003] cited in Diers et al. [2012]) and risk-adjusted return on capital (RAROC; Nakada et al. [1999] cited in Diers et al. [2012]). These metrics are compared conceptually by Kraus [2013] with the analysis of MCEV earnings (which is the embedded value terminology for P&L attribution). Kraus finds that both concepts are very similar and he shows a direct link between EVA / RAROC and P&L attribution.

Diers et al. explain that the “use of different performance metrics is problematic from a group manager’s point of view” (Diers et al. [2012], p. 321), “especially given the theoretical concern that separate optimization of different business units does not necessarily lead to a global optimum at group level”. (ibid. p. 321) Diers et al. transfer the MCEV methodology from life insurance to non-life insurance and explain the usefulness of a P&L attribution for non-life by presenting the P&L attribution of an illustrative German non-life insurance company.
The above means that a P&L attribution can also be useful for managing non-life insurance companies.

### 4.1.4. Value Relevance of Economic Value Measurement

“Value relevance studies aim to evaluate whether particular accounting numbers have empirical associations with market values of firm equity or changes in values in order to provide a basis for assessing the numbers usage or proposed usage by accounting standard setters.” (Holthausen and Watts [2001] cited by Almezweq and Liu [2012], p. 344)

Value relevance of economic value measurement translates for an insurance company in the question: Which valuation basis provides a better match between the net asset value of the company and the market value of the company? If economic value measurement is applied to insurance related obligations, does the calculated NAV have incremental relevance to the market value of the company?

The question of value relevance is important because “… long-term sustainable businesses decide on what is going to constitute the target for its performance objectives based on the true underlying economies of the business.” (Chappell [2014], p. 35) Companies should adopt a performance measurement based on the most ‘value relevant’ measurement approach.

Almezweq and Liu [2012] examine the voluntary European Embedded Value and Market Consistent Embedded Value disclosures of UK life insurance companies and find that voluntary embedded value disclosures (both EEV and MCEV) are incrementally value relevant over and above accounting information reported in statutory accounts. This means that for the UK life insurance sector, economic value measurement of insurance related obligations is more value relevant than the traditional approach.

### 4.1.5. Considerations for a Useful P&L Attribution

This subsection presents the practical considerations which are important for a P&L attribution to be useful for supporting management decisions, for both life and non-life insurance companies. The explanation builds on Anthony and Govindarajan [2007], who present an analytical framework for a generic (i.e. not insurance specific) company to quantify variances in actual period results compared
to budgeted profit level. Their analysis builds on one-period, statutory performance measures, nonetheless the comparison to expected (budgeted) figures makes it effectively very similar to the experience variance section of a P&L attribution.

“Budgets are important tools for effective short-term planning and control in organizations. A ... budget usually covers one year and states the revenues and expenses planned for that year.” (Anthony and Govindarajan [2007], p. 380) “It is a management commitment; managers agree to accept responsibility for attaining the budgeted objectives. The budget proposal is reviewed and approved by an authority higher than the budgetee. Once approved, the budget can be changed only under specified conditions.” (Ibid. p. 380) One principal purpose of a budget is “to obtain a commitment that is a basis for evaluating a manager’s actual performance.” (Ibid. p. 382)

The ideas presented by Anthony and Govindarajan related to the analytical framework for quantifying variances compared to budgeted profit level, are also applicable for a P&L attribution. Accordingly, the P&L attribution should incorporate the following ideas:

- Key causal factors have to be identified which affect change in NAV.
- “Try to calculate the specific, separable impact of each causal factor by varying only that factor while holding all other factors constant. ...”
- Add complexity sequentially, one layer at a time ... (‘peel the onion’).
- Stop the process when added complexity at a newly created level is not justified by added useful insights into the casual factors underlying the overall profit variance.” (Anthony and Govindarajan [2007], p. 427). Overall profit variance refers to totalNAV impact in the P&L attribution.

Chapter 0 presented a possible split of impacts, however a more detailed analysis might be needed to separate all key factors. E.g. lapse variance might be split by products, and then the next layer could be to split the effect of total surrenders, partial surrenders, top-ups, change in insurance coverage, etc.

The aim of splitting impacts is to arrive to a level which leads to action. “Profit reports are worthless unless they lead to action. The action may consist of praise for a job well done, suggestions for doing thing differently, ‘chewing out’, or more drastic personnel actions.” (Anthony and Govindarajan [2007], p. 438) “One of the most important benefits of formal reporting is that it provides the desirable pressure on subordinate managers to take corrective actions on their own initiative.” (Ibid. p. 438)
The design of a P&L attribution should provide an appropriate level of detail, i.e. it should ‘peel the onion’ until sufficient layers have been removed. “Effective systems identify variances down to the lowest level of management.” (ibid. p. 425) “The layers should correspond to the hierarchy of responsibility centers. Taking action based on the P&L attribution is not possible unless they can be associated with the managers responsible for them.” (ibid. p. 436)

However, Even if an appropriate level of detail is reached, the P&L attribution will not lead to an action if the quality of information is poor. “High quality decisions require high quality information.” (Laudon and Laudon [2010], p. 482) The following chart describes the “information quality dimensions that affect the quality of decisions. If the output of information systems does not meet these quality criteria, decision-making will suffer.” (ibid. p. 482)

<table>
<thead>
<tr>
<th>Quality dimension</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>Do data represent reality?</td>
</tr>
<tr>
<td>Integrity</td>
<td>Are the structure of data and relationships among entities and attributes consistent?</td>
</tr>
<tr>
<td>Consistency</td>
<td>Consistency: Are data elements consistently defined?</td>
</tr>
<tr>
<td>Completeness</td>
<td>Completeness: Are all the necessary data present?</td>
</tr>
<tr>
<td>Validity</td>
<td>Validity: Do data values fall within defined ranges?</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Timeliness: Are data available when needed?</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Accessibility: Are the data accessible, comprehensive, and usable?</td>
</tr>
</tbody>
</table>

3. Information quality dimensions

Source: Laudon and Laudon [2010], p. 482, table 12-3 (corrected)

4.1.6. Limitations on Usefulness from Management Perspective

The P&L attribution is not a universal tool for management decision making. It is not suitable for certain purposes and the information gained with it has limitations. The below described constrains should be considered when designing and applying a P&L attribution for management information purposes. The description is based on the findings of Anthony and Govindarajan about the analytical framework they present for quantifying variances compared to budgeted profit level.

“The most important limitation is that ... it does not tell why the variances occurred or what is being done about it.” (Anthony and Govindarajan [2007], p. 437) E.g. a negative impact on NAV due to lapse variance impact might be caused by an ongoing promotion campaign, where the company
encourages its clients to lapse their existing contracts and conclude a new ones. Continuing this example, in light of the ongoing promotion campaign, even a very impressive new business value might gain a negative message, if it resulted in less value creation than the NAV lost due to the lapsed contracts.

“A second problem ... is to decide whether an impact is significant.” (ibid. p. 437) Conceptually, an impact should be investigated only “when the benefit expected from correcting the problem exceeds the cost of investigation.” (ibid. p. 437) Statistical techniques or expert judgement can be applied to set the levels of significant impacts. E.g. for non-life portfolios, the usual variability of claims could be analyzed to set significance limits on non-life claim variance in the P&L attribution. It is also important to mention that if an impact is “significant but uncontrollable ... there may be no point in investing it”. (ibid. p. 437) An example could be the effect of change in yield curve, even though that in chapter 6.2 it will be discussed that change in yield curve can be attributable to management.

A third limitation is that as impacts “become more highly aggregated, offsetting variances might mislead the reader” (ibid p. 437). E.g. an overall neutral morbidity variance might be caused by good results on accidental death coverage and poor claim experience on accidental disability coverage.

Also, as the impacts presented in a P&L attribution “become more highly aggregated, managers become more dependent on the accompanying explanations”. (ibid. p. 437) The manager of a certain line of business (e.g. household insurance for a non-life company) knows what is happening related to her portfolio of contracts, however senior managers usually must depend on the narratives accompanying the P&L attribution.

Finally, the P&L attribution reports “show only what has happened. They do not show the future effects of actions that the manager has taken.” (ibid. p. 438) E.g. management might plan to introduce retention programs which aim to increase client loyalty, thus decrease lapse rates. The effect of such a plan will be first visible in the experience variances after the program has been implemented. Assumptions in turn might allow for the effect of such a retention program even later, when there is enough evidence that the decrease in lapses is permanent. Nonetheless, the P&L attribution can be prepared to partly solve this shortcoming, by presenting also forecasted figures for upcoming periods, as described in chapter 3.3.

Compared to a budget, a forecast is “merely a prediction of what will most likely happen, carrying no implication that the forecaster will attempt to shape events that the forecast will be realized. ... The
forecaster does not accept responsibility for meeting the forecasted results. Forecasts are usually not approved by higher authority. A forecast is updated as soon as new information indicates there is a change in conditions.” (Anthony and Govindarajan [2007], p. 381) Continuing the example, the planned effect of retention programs can be allowed for in the forecast for the upcoming time periods.

4.2. Creates a Sound Valuation Environment

The valuation of insurance related obligations can be very complex under economic value measurement and there are numerous pitfalls on the long way of evaluation.

Detailed models have to be established to make projections regarding the settlement of insurance obligations. The complexity of calculations makes it nearly impossible to maintain completely error-free codes. Also, these models use simplifications to keep the code as simple as possible. E.g. they might assume that clients owning regular premium policies pay their premium on a certain day of a month or that claim payment happens exactly at the time when the claim incurs.

On the other hand these calculation tools use a number of inputs. First of all, information regarding the obligations has to be collected, like the duration of a contract, details of the insurance coverage and charges to be deducted from the policyholder. This information is retrieved usually from a so-called ‘portfolio system’ – or even rather from not even one but more portfolio systems. These systems – even if well maintained – can cause serious errors simply by providing wrong information on the features of the obligations.

Then, assumptions have to be developed and kept up to date, using all relevant information available. They are usually set and updated based on analyzing past experience. Sometimes plans and known changes are also allowed for in the assumptions, e.g. if new processes are implemented to avoid fraudulent claim payments regarding household portfolios, then the claim experience of the past might overestimate future claim payments.

While setting assumptions, consistency between experience analysis and modelling needs to be maintained. E.g. if the model calculates lapses of life insurance policies on a per policy basis, i.e. lapse rate is the ratio of number of lapsed policies to total opening number of policies), then the assumption has to be set accordingly. If the lapse assumption is set as using the fund value instead of
number of policies (i.e. lapse rate is the ratio of fund value of lapsed policies to total opening fund value of policies), then the modelled number of policies will be distorted, which might lead to incorrect projection of expenses, if those are modelled on a per policy basis.

The experience variance section of the P&L attribution provides a back test opportunity for the valuations. The variances compare model results with actual performance and by analyzing the drivers behind the differences, errors can be detected. An expense variance might be due to not correct assumptions, a non-life claim variance due to an error in the portfolio system and mortality variance might be caused by a model error.

4.3. Enforces Information Flow within the Company

The influence on the organization has to be considered when analyzing the usefulness of a P&L attribution.

The valuation of insurance related obligation is very complex, as outlined in the previous section. The steps of the valuation process might be carried out by different employees, even by separate departments. E.g. the models might be maintained by the modelling department, assumptions set by the valuation department and the end results of the calculations used by the product pricing department.

Maintaining a formal P&L attribution reporting can enhance the cooperation between participants in the valuation steps. The P&L attribution helps to develop and maintain a holistic view of the company, i.e. when the company as a whole entity is considered.

Laudon and Laudon [2010] provide two definitions for the organization. According to the technical definition, an organization is “a stable, formal social structure that takes resources from the environment and processes them to produce outputs.” (Laudon and Laudon [2010], p. 107) According to the behavioral definition, an organization is “a collection of rights, privileges, obligations, and responsibilities that are delicately balanced over a period of time through conflict and conflict resolution.” (ibid, p. 108)

Establishing the process of calculating the P&L attribution report might have a serious impact on the privileges, obligations and responsibilities on an organization. The impact of implementing the results
of a P&L attribution in management decision making might be even more significant. “Information systems inevitably become bound up in organizational politics because they influence access to key resource – namely, information. Information systems can affect who does what to whom, when, where, and how in an organization.” (Laudon and Laudon [2010], p. 118)

 Nonetheless, such organizational impacts might be welcome and desired, i.e. can contribute to the usefulness of P&L attribution reports.

### 4.4. Informs Shareholders

The P&L attribution can be useful for shareholders too. “Shareholders invest capital into a company with a view that they will receive both a dividend stream and an increase in the value of their capital investment.” (Chappell [2014], p. 30)

Shareholders may have the following primary performance interests:

1. ... grow a profitable franchise to build the value of the business the company has today. The assessment of the value of the company should reflect a value ... that the company has now, and an amount to reflect the additional value someone would place on the company’s ability to create additional profits from its new business generating capability, should he or she want to buy the company. ... 
2. ... understand the true economics of the business and the realistic potential profits that could occur over time and thus, the likely income they may receive and return on capital invested.
3. ... stakeholders will benefit from understanding how capital is being allocated to achieve best economic use.” (Chappell [2014], p. 36-37)

In accordance with the above stakeholders will be interested in the following three financial performance measures: enterprise value, risk-adjusted value of value creation, and risk-adjusted return on lifetime economic capital (ibid. p. 37)

Enterprise value is the economic value of the equity of a company. However, even if all ‘regular’ balance sheet items are measured with economic value for an insurance company, the market value might exceed the NAV. The difference between the NAV and the market value of the total company is called goodwill. Goodwill is the “present value of the profits that could arise and be transferred to
shareholders in the future from business that will be written over the coming years.” (ibid. p. 38) The P&L attribution can be used to track the changes in the enterprise value without goodwill.

Risk adjusted value created measure “determines the economic profit adjusted for the costs of the risks being taken.” (Chappell [2014], p. 38) In the P&L attribution, this is the value of new business.

Risk-adjusted return on lifetime economic capital (RARLEC) “is a relative measure of economic value and capital efficiency, the primary purpose of which is to assist in making decisions about allocating capital efficiently between new opportunities.” (Chappell [2014], p. 42) Chappell [2014] defines RARLEC as a ratio where the numerator is new business value and the denominator is the present value of lifetime economic capital requirements. The denominator can be expressed also via the risk margin because the risk margin is equal to the present value of lifetime economic capital requirements, multiplied with the cost of capital rate.

4.5. Informs Investors

In case of a merger or acquisition, the parties buying the stake of an insurance company, i.e. the investors need information to assess the enterprise value of the company. NAV is one component of enterprise value. The sensitivity of NAV to certain factors is also important information for investors, which can be uncovered by analyzing the variance and assumption change impacts of previous periods. Additionally, the sound modelling environment established by the P&L attribution might also reduce the risk of an acquisition or merger transaction from investor perspective.

4.6. Informs the Financial Supervisory Authority

The financial supervisory authority (the regulator) is primarily “concerned with customer protection and that, with a reasonable degree of certainty, a company will be able to meet its obligations as they fall due.” (Chappell [2014], p. 31)

To meet their objective, regulators of insurance companies apply a set of rules e.g. on minimum level of equity capital, on investment policy and on the risks which can be covered. Organizational requirements are set to minimize the possibility of fraudulent reports.
The P&L attribution can help explain changes in the solvency position of the company, which is the ratio of available capital (basically the net asset value) to the required capital. The required capital is set on a level that makes it possible for the insurance company to meet its obligations with a very high probability. The P&L attribution can be used to make a link between the current solvency position and that of the previous period.

Also, the P&L attribution can be used to demonstrate that the insurance company maintains a sound valuation environment.
5. Use of Economic Value Measurement among Insurers in Hungary

I have conducted a survey among insurance companies operating in Hungary to gain practical insights on the usefulness of economic value measurement to insurance liabilities. This chapter describes the design of the survey and the process of how the answers were collected. Finally, the responses will be analyzed.

5.1. Design and Data Collection Process

This section outlines the content of the survey questions and the process that was followed to collect responses.

The survey itself was inspired by a similar investigation presented by Klumpes [2005]. Klumpes employed a survey “to examine what economic and organizational factors could condition managerial propensity to use three alternative measures: traditional accounting-based measures, Economic Value Added (EVA) and multiperiod, actuarial cash flow based measures such as embedded value (EV).” (Klumpes [2005], p. 171) Klumpes surveyed the chief executive officers of the top 50 U.K. based life insurance companies. He found that “life insurance CEOs are more likely to use EV for strategic management planning and control purposes and that this preference is strongly conditioned by the firm’s ownership structure.” (ibid. p. 171) Klumpes refers to ‘ownership’ as the distinction between publicly traded stock firms and mutual companies. He finds that mutual companies in the UK “are more likely to use accounting-based performance measures for management planning and control purposes than are stock firms.” (ibid. p. 182)

The survey presented here is different, both in design and aim. On one hand, it was not limited to life insurance companies, but covered also non-life insurers. On the other hand, it focuses on calculation frequency of economic value frameworks and on the analysis reasons of such reports from both a management perspective, or non-management perspectives (back testing of actuarial models and assumptions, etc.).
The main questions of the survey presented here are the following:

- Q1: Size of the company – Was gross written premium over 100 million EUR in 2014?
- Q2: Type of the business: only life, only non-life or both life and non-life
- Q3: Basis of company target measures: rather accounting based or rather economic value based metrics are used?
- Q4-6: Which economic valuation frameworks are used? How often are they prepared?
- Q7-8: For what purposes are the valuation frameworks used?
- Q9-10: What are the factors that limit the usefulness of valuations with economic value measurement?

The complete questionnaire can be found in Appendix A.

It has to be noted that the statutory reporting basis in Hungary is the traditional approach, therefore economic value measurement calculations are done on a voluntarily basis by insurers.

The survey was sent to insurance companies, that are members of the Association of Hungarian Insurance Companies (Magyar Biztosítók Szövetsége). In total, twenty-one chief actuaries and – for one company – a chief financial officer were asked to respond to the survey.

The email inviting for participation in the survey was sent on March 18, 2015. A period of 3 weeks was open to submit results. Two reminder emails have been sent, the first on March 25, the second on April 9.

To protect anonymity of responders, surveys were collected via email by Prof. Dr. Erzsébet Kovács, head of the postgraduate study program at the Corvinus University of Budapest. She then sent the collected results to the author.

Altogether eight completed surveys were returned. One responder submitted two surveys for his company, one for the life business and one for the non-life business.

One additional respondent explained that internal rules prevented him or her from participating.
5.2. Analysis of Responses

This section analyzes the responses provided.

Regarding the size of the companies (Q1): Two responding entities earned more than 100 million EUR gross written premium during 2014 and are considered here as ‘large’ companies. The remaining six entities earned below this limit, and will be referred to as ‘small’ companies.

Regarding the type of business (Q2): Out of eight companies, four operate in life insurance business only, one possesses only non-life portfolios and three responders operate in both life and non-life business.

Targets are based (Q3) completely or mainly on accounting measures (such as gross written premium or technical result) for seven out of eight responders. Economic value metrics (like value of new business) were either not used at all or were just partly used by six out of eight responders. Interestingly, a small company reported that its targets are based on economic value metrics rather than accounting based ones.

To the question of which calculation frameworks are maintained by the company (Q4), all participants reported to calculate Solvency II. Six insurers indicated that they have carried out Solvency II valuations in the recent past and two companies plan to calculate Solvency II in the coming twelve months. These results are unsurprising, given that all respondents will be required to comply with the Solvency II regulation, that will go live in less than a year from the time of this analysis.

Frameworks other than Solvency II are also in use: Embedded value (EV) was calculated by three companies in the past two years and one insurer plans to calculate embedded value during the next 12 months. Also company own valuation frameworks were used by three responders. One of them uses its own framework for new business valuation only. One additional company reported using an “Other framework”, which is the Solvency II standard formula with alternative scenarios.

Regarding the frequency of total company value calculation (Q5), respondents assessed the frequency of economic framework calculations on a scale of 1 to 5 where 1 means “infrequently” (e.g. less than annually) and 5 means “very often” (e.g. monthly). All respondent who used Solvency II, scored with 2 or 3. Embedded Value was calculated by its users more frequently. They scored with
an average frequency of 3. Own framework and modified Solvency II standard formula users carried out the calculations the least frequently, with an average score of 2.

The frequency of new business value calculations (Q6) was reported to be the same as the frequency of total company value measurement. Some respondents, however, did not calculate new business value with Solvency II framework.

Respondents were asked to assess whether the results of valuations are used for management decisions (Q7). Solvency II was used by three companies for either strategic decisions (like capital allocation) or mid-term decision making (like quarterly discussed) and the remaining five companies plan to use Solvency II results for decision making in the next 12 months.

Embedded value is only partly used for decision making. Out of the three companies, who already calculate EV, only one indicated that they use it, and they employ it for strategic decision making. The company planning to calculate EV in the next 12 month plans to use it for decision making.

According to the responses, own framework results are used rather frequently: Companies who carry out valuations with their own frameworks employed them in mid-term decision making (e.g. quarterly discussed), or they plan to employ the results in the next twelve months. One user also stated to have used them for day-to-day business, however this seems to be rather a wish than reality: the same company answered in Q5 that it did not perform calculations in the past two years.

Respondents were also asked to assess the usefulness of the P&L attribution for given purposes (Q8). The survey described purposes and participants were asked to assess the importance of those actions on a scale of 1 to 5 where 1 means “not really” and 5 means “absolutely”.

The purposes with the highest scores were ‘informing regulators’ and ‘fulfilling the requirements of parent company or regulators’, both with an average score of 3.8. Uses related to ‘back testing of actuarial models and assumptions’, and ‘informing senior management’ was valued to be medium important (with average scores of 3.0 and 2.8, respectively). The purpose of ‘informing investors’, and that the P&L attribution could ‘enhance cooperation between departments of the company’, was scored rather low, but still evaluated as partly applicable (with an average score of 2.4 for both purposes)
The survey also asked why economic valuation frameworks could not be used (Q9). Participants were asked to assess, how true specific statements are, on a scale of 1 to 5 where 1 means “not really” and 5 means “absolutely”.

The most important factors limiting the usage of economic frameworks were the following: (Average scores are indicated in brackets)

- Such calculations are not required, e.g. by parent company or regulator (3.3)
- The costs of such calculations exceed the benefits (3.0)
- The company is too small to perform such calculations (2.8)

Companies disagreed with the statement that the ‘value of new business is not a good measure for sales performance’ (average score of 1.9).

They also disagreed with the statement that the ‘volatility of their business would make such calculations not useful’ (average score of 1.5). However, it has to be mentioned that the one ‘only non-life’ insurer participating in the survey did not provide an assessment to this statement. The results for this statement are similar, if ‘only Life’ and composite insurers are analyzed separately.

To the question about whether the company or the parent company is a stock firm (Q10), seven participants provided an answer: three being “Yes” and four being “No”.

Altogether, it can be stated that Hungarian insurers are familiar with economic value measurements. They employ or plan to employ Solvency II, but also embedded value and own frameworks are also calculated. These are used mainly for strategic decision making and partly for mid-term decisions. Hungarian insurers prepare these calculations most importantly to fulfill requirements of either their parent company or the regulator, but they also find it important to back test their models and assumptions with them.
6. Practical Challenges in Preparing a P&L Attribution

This chapter explores some P&L attribution aspects, which can become problematic when the report is implemented in practice. On one hand, issues will be discussed which can cause problems when the figures are calculated. On the other hand, interpretation of the results might become challenging. At the end, the expected relationship between experience variances and assumption changes will be explored. All of these categories can result in impaired usefulness of the P&L attribution.

The contents in this chapter are based on my experience with P&L attribution reports.

6.1. Challenges from Calculation Perspective

This section explores typical practical challenges one might face when preparing a P&L attribution. The following issues will be discussed in detail below:

- Calculation of expected interest on assets
- Surplus equity allocation to business lines
- Corporate tax impacts, deferred tax elements
- Different calculation frequency for new business value and P&L attribution
- Analysis of unexplained movement

An asset model is required to calculate precisely the expected interest of assets in the expected business contribution. Such an asset model projects for each modelling period the opening and closing value of assets. The expected interest for each projection period is the opening value times the risk-free forward interest rate. An asset model for assets backing insurance liabilities uses the cash flows projected for the liabilities, such as premium income or benefit payment to clients, to calculate the opening and closing asset values.

If there is no asset model in place, the expected interest of assets might be estimated for the whole period by multiplying the value of assets at beginning of period with the risk-free forward interest rate for the whole period. The whole period might be a year or a quarter of a year, whereas liabilities could be modelled in monthly steps. Such a simplification regarding asset modelling becomes increasingly problematic when significant cash flow movements happen during the period, e.g. when savings type life-insurance policies mature during the period. After the maturity benefit is paid, the
projection on the liability side does not calculate with any expected interest, whereas the simplified approach for assets includes expected interest for the whole period.

Another challenge multi-line insurers might face is to allocate the surplus to each line of business. Surplus is the value of assets which are not backing liabilities, i.e. which are backing the equity. For economic performance reports, a useful approach is to allocate to each business unit exactly the economic capital, which is the amount of capital required to ensure that the liabilities of the unit can be settled with an appropriately high probability (e.g. 99.5% on a one year time horizon). The value of assets left unallocated is the free asset of the insurance entity. Performing the allocation of the surplus assets to business lines can be challenging.

The presentation of corporate tax related items can be also problematic. Corporate tax is levied on the profits the company makes. First of all, it needs to be decided whether the impacts of P&L attribution factors are shown gross of tax (i.e. excluding the impact of profit taxes) or net of tax. In the gross of tax presentation, a separate ‘tax impact’ factor needs to be calculated, which allows for all corporate tax related changes in the NAV of the company.

A further modelling aspect of profit taxes is the calculation of deferred tax items and their inclusion in the P&L attribution. Deferred taxes (DT) can be both assets and liabilities. A deferred tax asset is an allowance for a future decrease in corporate tax payment due to an expected loss. A deferred tax liability allows for an expected future corporate tax payment. Deferred taxes can be calculated either on a going concern basis or with an exit value. The valuation approach might be different for DT compared to the valuation of insurance liabilities, e.g. DT might be valued on exit value, even if going concern basis is used for insurance liability valuation. In this case, deferred taxes calculate the tax impact of an immediate transfer of the insurance liability. Items like deferred policy acquisition cost or reserves other than technical provisions – which affect the corporate tax payment in the event of transferring an insurance portfolio – need to be considered too. Reserves other than technical provisions might be e.g. provisions set up due to a liability adequacy test.

The calculation frequency of new business value and the P&L attribution might not be the same. It is possible, that for the monthly or quarterly management reports only new business value is calculated, whereas P&L attribution is prepared only rather infrequently, e.g. yearly. In this case, the new business value in the P&L attribution could be simply the sum of reported new business values. Therefore, the NAV impacts related to new business in the P&L attribution have to be calculated for each reported new business portfolio separately.
Finally, the analysis of unexplained variance in a P&L attribution can be really challenging, because generally this is a balancing item to capture the impact of not analyzed factors. It might seem an odd question, why to ‘explain’ the unexplained impacts? The answer is very simple: to maintain a sound modelling environment. Serious errors might remain uncaptured in the experience variance impacts and could be included in the balancing impact. Even a low volume of unexplained variances does not warrant that the valuation is free of significant errors: offsetting impacts might result in low unexplained variance in the actual period, however distort greatly the projections.

6.2. Challenges in Interpretation of P&L Attribution Results

The P&L attribution is not easy to understand, which can reduce its usefulness. The below aspects should be carefully considered and appropriately handled:

- Interpretation of expected business contribution
- Calculation vs presentation order
- Operational vs non-operational items

Expected business contribution is hard to interpret for the reader who is not familiar with the technical details of the calculation, in particular for the management. It might seem strange why the company value changes, if everything unfolds according to the assumptions. An additional complexity to expected contribution is given by new business value, if a point of sale valuation is used to measure new business impact. If this is the case, expected contribution will also contain the change in value of these policies from point of sale to end of period. At the end of the day, if the numbers are not understood by management, usefulness of the P&L attribution might be reduced.

The calculation order of impacts might differ from the presentation order. The description in chapter 3.1 followed a possible calculation order, however it might be useful for information purposes to rearrange the results, which might in turn mislead the reader about the interpretation of the figures. For example: corrections and model changes might be presented rather at the end of the analysis as they relate to the valuation methodology applied, not to the actual business performance. However, if a significant model change happens during the period, experience variances and assumption changes might be misinterpreted, because they are presented before the model change impact, but their calculation already uses the new model.
A typically applied rearrangement is to show operational impacts first, i.e. those impacts which can be attributable to management. However, it is not always straightforward, which factors are operational. Change in NAV due to dividend payment and capital injection is definitely non-operational. Expected business contribution, model changes and corrections are usually operational. Most of the experience variances and assumption changes are also operational, except of financial market related impacts and one-off legislation changes.

It is questionable whether variances and assumption changes related to financial markets are operational or not. Typically, they are considered non-operational, like in the analysis of MCEV earnings (CFO Forum [2009], p. 27). This is caused by the fact that management has not much influence on how interest rates change or equity indices behave. However, it can be argued that management has tools to control the impact of financial markets on NAV. For example, if the upward movement of interest rates has negative impact on the company value, this could be offset by a hedge program. The hedge could be achieved by acquiring financial instruments which gain on value, if the interest rates move upwards. Also, entering into new markets or acquiring new lines of businesses (i.e. increasing diversification) can limit the impact of financial markets.

6.3. Consistency between Variances and Assumption Changes

Investors tend to value and make use of the results provided via a P&L attribution for their assessment on a particular business or company. The magnitude of experience variances, as well as their tendencies in time strongly influence the reliability of the economic valuation. Furthermore, the experience variances and assumption changes are regularly shown and interpreted side by side.

It seems reasonable to expect that the assumption change impact should be approximately the experience variance impact multiplied by the duration of the liability portfolio. This is expressed by the below formula.

\[ \Delta NAV_{F}^{assumption} = \Delta NAV_{F}^{variance} \times Duration \]

Where the left side of the equation includes the assumptions change impact of factor F on NAV. The right side includes the variance impact of factor F on NAV, multiplied with the duration of the liability portfolio, measured in in the length of the period of the experience variance (e.g. 5 years = 20 quarters = 60 months).
To give an example: let us assume that the P&L attribution is prepared for a time period of one year. If the expense experience variance shows an impact of +1 million EUR on NAV, this means that actual expenses for the period were by 1 million EUR lower than projected. One could expect that less maintenance expenses could be projected for the future too, given the actual variance. If the average in-force duration of policies is 5 years, than it seems reasonable to expect the following assumption change impact of +5 million EUR, as it can be seen below:

$$\Delta \text{NAV}_F^{\text{variance}} = 1 \text{ million EUR}$$

$$\text{Duration} = 5 \text{ years}$$

$$\Delta \text{NAV}_F^{\text{assumption}} = 1 \text{ million EUR} \times 5 \text{ years} = 5 \text{ million EUR}$$

If assumption change impact was significantly different from the expected, then the credibility of results might become weaker, limiting the uses of the P&L attribution. But should this relationship always hold?

There are circumstances, which can distort the relationship. For example a one-time impact can influence experience variance, but not affect assumption changes. This is the case when e.g. many policies lapse because of a broker fraud or an exceptional expense item was realized.

Significance limits have to be also considered: in case of not significant variances, no assumption change should be expected at all. This is even more important when the P&L attribution is prepared rather frequently, because the shorter the observation period for the variances, relatively the more volatile can the experience variances be.

Often, the period which was analyzed to set assumptions is not equal to the actual period of the P&L attribution. E.g. lapse rates are usually set by analyzing the past few years’ experience, however the P&L attribution might show the experience of a shorter period, like the most recent quarter. Also, the approval process of assumptions might make it nearly impossible to include the most recent experience. There is usually a few months gap between the time when the proposal on assumptions is prepared and when the assumptions are finally used in valuations. However, if there is a lasting trend in experiences, these should be still captured by the assumptions.
It is also true that the above relationship between variances and assumption changes holds mainly for homogenous portfolios only. If two sub-portfolios have very different durations, then the impacts aggregated on total portfolio level might not resemble the relationship based on their average duration. Let us continue the example of positive expense variance. Let us assume also that there are two major products in the portfolio, and expense assumptions are set separately for each product. One product has an average duration of one year, whereas the other product has a duration of 10 years. It might happen that expense variance impacted the two products differently: the total positive variance resulted from a bigger positive variance on the ‘short’ product and a negative but smaller variance on the ‘long’ product. In this case the assumption change impact on total portfolio level might be even negative, even though the total portfolio variance was positive.

A further bias can be caused by the order of calculations. If there are major portfolio variances (e.g. many policies lapsed), then the assumption change impact will be calculated on a significantly different basis than variances.

The P&L attribution should be prepared to forego any bias in credibility, to the extent possible. For example, the cross company split of impacts explained in chapter 0 should aim to analyze homogeneous sub-portfolios. Significance limits should be set as described in 4.1.6. Additionally, it should be analyzed, if assumption changes seem not credible. The analysis might reveal also errors in the calculation. The analysis of variances and assumption changes might help to reveal the profit sensitivities of the company, which is useful e.g. for an investor.

The credibility of experience variances can be verified by the assumption change impacts. Additionally, the economic capital for certain risk factors can also be used to verify the magnitude of variances and assumption changes.
7. Summary and Outlook

This thesis explores possible uses of P&L attributions with economic value measurement for insurance companies. It aims to describe, how to design and maintain a report, which provides the most value to its stakeholders.

To achieve this, first the theoretical background of insurance liability valuations are discussed in chapter 2. Balance sheets of insurance companies are liability driven. Insurance obligations are rather long term, even in case of non-life portfolios. A distinction is made between valuation standards for insurance obligations: the ‘traditional approach’ is a conservative basis which often results in delayed profit recognition. In Hungary, the statutory reporting basis follows currently the ‘traditional approach’. The other category is called ‘economic value measurement’, which allows for the time value of money and the cost of taking on risks, e.g. embedded value or Solvency II.

Chapter 4.1 explores why it is worth for insurance companies to base their reports on economic value measurement. For Life insurance companies, such measurement is empirically more value relevant to the market value of an insurance company than results of the traditional approach. For non-life companies, performance measures already used in practice (EVA, RAROC) implicitly apply economic value measurement.

A P&L attribution connects the equity of the company between two valuation dates. In chapter 3.1, a detailed grouping of factors impacting equity is presented, if economic value measurement is applied to insurance related obligations.

The stakeholders of the report are analyzed in chapter 4. First of all, management can use the P&L attribution for decision making. The thesis draws a parallel to management controlling systems and management information systems. It is revealed that for the P&L attribution to lead to action, all the impacts on equity need to be broken down to the lowest level of management, to associate the impacts with managers responsible for them. Chapter 3.2 describes how to prepare a cross-company split of movements. Chapter 4 explains also that data quality needs to be ensured to enable usefulness for management decisions. Additionally, limitations of P&L attributions are highlighted, namely:
The thesis presents solutions, which can allow for the above shortcomings of P&L attribution figures, such as setting limits for significant impacts or including also forecasts and budgeted figures in P&L reports to present the future effect of management actions.

Not just management can use P&L attributions. Another important purpose is to back test actuarial models and assumptions. A P&L attribution offers unique opportunity to compare projected behavior with actual, in the experience variance section. Also shareholders, investors and regulators can be informed via this report about the company. Ultimately, organizational impacts of a P&L attribution are discussed, namely that it can improve cooperation between departments of an insurer.

Chapter 5 describes the results of a survey conducted for the thesis on the use of economic value frameworks in Hungary. Results show that besides Solvency II – which was compulsory for all responders – also embedded value and company own valuation frameworks have been applied or are planned to be applied among insurance companies in Hungary. The P&L attribution is mainly used by management for strategic and mid-term decision making. Also the back test opportunity was confirmed to be an important purpose for Hungarian insurers.

Chapter 6 describes practical challenges related to the calculation and use of P&L attributions. Calculation related challenges include the quantification of expected interest on assets, allocation of equity to lines of businesses, corporate tax related issues and the importance of investigation of unexplained experience variances. The use of P&L attribution might be impaired by misunderstanding of expected business contribution. It might also lead to misunderstanding, if the presentation order of impacts does not follow the calculation order. Chapter 6 also explores the question of consistency between variances and assumption changes, where cases are presented which can cause bias in the consistency.

The thesis could not cover many interesting topics. First of all, the investigation could be continued by considering how the franchise value of the company could be included in the analysis. Shareholders are also interested in the company’s ability to create additional profits from its new
business generating capability. It could be investigated how the impacts on franchise value could be included in the P&L attribution.

Also, the usefulness of P&L attribution could be explored in particular for Central and Eastern European insurance companies, where insurance portfolios tend to be rather small, i.e. volatile compared to more developed regions. Also, financial markets might not be deep and liquid enough to enable the calculation of quality results.

The usefulness for non-life companies could also be investigated further: although the current thesis considered non-life portfolios explicitly, it could be worth to expand the analysis in this direction, e.g. by proposing P&L attribution calculation methods for non-life portfolios.

Finally, the analysis could be extended to ‘no gain at issue’ valuation frameworks. For example the currently discussed draft proposal on the valuation of insurance related obligations in IFRS uses a ‘no gain at issue’ valuation approach.
8. References


de Weert, Frans [2011]: Bank and Insurance Capital Management. John Wiley & Sons Ltd, Chichester
Appendix A. Complete Survey

This appendix includes the complete survey on the use of economic value calculation, that was analyzed in chapter 5. The below content was shared with participants in the survey.

Overview and purpose

This survey is being conducted by a postgraduate student in the Actuarial Science program at the Corvinus University of Budapest. It aims to gather information about the use of Economic Value calculation frameworks among Hungarian based insurance companies. The data collected will be used in an academic paper which will be made available to the public. The author is member of the Hungarian Actuarial Society and holds an actuarial position at Aegon CEE B.V. in Budapest.

Individual answers will not be disclosed. Results will be reported in aggregate forms (averages or sums) and if less than three answers will be submitted, no results will be used at all. Any individual question can be omitted. To ensure anonymity, filled in forms will be collected by Prof. Dr Erzsébet Kovács – head of the postgraduate program – who will send them to the author.

Filling out the survey takes about 10 minutes. Please submit before 10th April 2015 to erzsebet.kovacs@uni-corvinus.hu.

All participants will receive the results of the survey. For questions, contact: szabo.zl@gmail.com

Survey Items

In the following, the term “company” refers to the total Hungarian operations of your insurer, including subsidiaries operating on the Hungarian market.

Q1: In 2014, did the Gross Written Premium of your company exceed 100 million EUR?

Q2: What type of insurance does your company sell?
Possible answers: Only life / Only non-life / Both life and non-life / No answer
Q3: On a scale of 1 to 5 where 1 means “Not at all” and 5 means “Completely”, how true are the following statements?

- Company targets are based on accounting information (metrics like Gross Written Premium, Profits, Technical result ... etc.):
- Company targets are based on economic value metrics (e.g. Value of New Business, Return on Economic Required Capital ... etc.):

Q4: Which of the below frameworks have been used to calculate the Economic Value of the company in the past 2 years? If not calculated until now, is it planned for the next 12 months?

Please choose from the following:

A = It has been calculated in the past 2 years

B = It is planned to be calculated in the next 12 months

X = Neither calculated nor planned

NA = No Answer

- Embedded Value (EV):
- European Embedded Value (EEV):
- Market Consistent Embedded Value (MCEV):
- Solvency II:
- Company own framework:
- Other framework:
- If “Other framework” was used or is planned, please describe it briefly here:

Q5: On a scale of 1 to 5 where 1 means “Infrequently” (e.g. less than annually) and 5 means “Very often” (e.g. monthly), how frequently has the Economic Value of the company been calculated with the below listed frameworks in the past 2 years?

Mark with X “if not calculated in the past 2 years” and with NA for “No Answer”

- Embedded Value (EV):
- European Embedded Value (EEV):
- Market Consistent Embedded Value (MCEV):
- Solvency II:
- Company own framework:
- Other framework:
Q6: On a scale of 1 to 5 where 1 means “Infrequently” (e.g. less than annually) and 5 means “Very often” (e.g. monthly), how frequently has the Value of New Business metric been calculated with the below listed frameworks in the past 2 years?

Mark with X “if not calculated in the past 2 years” and with NA for “No Answer”

- Embedded Value (EV):
- European Embedded Value (EEV):
- Market Consistent Embedded Value (MCEV):
- Solvency II:
- Company own framework:
- Other framework:

Q7: Indicate whether the following valuation frameworks were used in strategic, medium term and / or short term decision making process. If not used in any, indicate if there are plans to use them in the next twelve months.

Choose any that apply:

A = Used, strategic (capital allocation, M&A)
B = Used, medium term (typically quarterly discussed)
C = Used, short term (day-to-day business)
D = Planned to use in next 12 months
X = Not used and not planned to use
NA = No Answer

- Embedded Value (EV):
- European Embedded Value (EEV):
- Market Consistent Embedded Value (MCEV):
- Solvency II:
- Company own framework:
- Other framework:
Q8: On a scale of 1 to 5 where 1 means “Not really” and 5 means “Absolutely”, how important are the following actions related to the economic value based Income Statement (e.g. EEV Movement Analysis) for your company?

Back testing actuarial models and assumptions:
- Informing investors (e.g. published externally):
- Informing regulators (e.g. in Solvency II):
- Improving cooperation between Finance, Risk and Actuarial specialists within the company:
- Fulfilling requirements (e.g. by parent company, regulator):

Q9: On a scale of 1 to 5, where 1 means “Not really” and 5 means “Absolutely”, how true are the following statements?
- The company is too small to perform such calculations:
- The company’s business is too volatile for Economic Value calculations to be useful:
- It is not worth to perform such calculations (costs vs. benefits):
- The company is out of scope of Solvency II:
- Value of New Business is not a good measure for sales performance of the company:
- Such valuations are not required (by parent company, regulator):

Q10: Are shares of the company or the parent company publicly traded on a stock exchange?