

Internal Model Industry Forum: Profit and loss attribution – the road ahead

Internal
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Foreword



In order to gain approval for the use of an internal model, the Solvency II regime requires insurers to perform a regular review to ensure that the model accurately reflects the real world causes and sources of profit and loss across lines of business.

This exercise should also be a valuable risk management tool. It should add value for insurers by supporting the robustness and prudence of the assumptions in their strategic plans, building confidence in the interaction between the model and the business and helping Boards understand the inherent risk profile.

This guidance summarises and reflects the significant progress that has already been made across the market in establishing how such a review should be conducted. We would anticipate that more will be learned as these processes become more widely used and are tested under different market conditions. Board level engagement of course will remain crucial.

I would like to thank Barney Wanstall and Russell Ward and the other members of their project team for their extensive work researching and developing the approach in this booklet. Our IMIF Steering Committee provided overall project guidance and peer review. We are grateful to representatives from the Prudential Regulation Authority (PRA), who have enabled us to maintain a continuous and positive dialogue between industry and the regulator on our work. I would also like to thank our sponsors EY, LCP, Milliman and PWC. As a not-for-profit organisation IRM is reliant on enlightened industry support to help us publish documents like this. It is this kind of support that helps us maximise our investment in the development and delivery of world class risk management education and professional development.

**Jose Morago,
IRM Chairman and Founder of the
Internal Model Industry Forum**

Executive Summary

Introduction

The Institute of Risk Management's Internal Model Industry Forum (IMIF) working group on Profit and Loss Attribution (P&LA) has produced this guide to support firms in continuing the development and implementation of robust Solvency II (SII) P&LA processes that help build confidence around internal models and add value to the business.

Under SII, P&LA analysis is expected to be used by firms as one of the validation tools to test areas such as model assumptions and model structure as well as facilitating a comparison of experienced risks and associated profits or losses versus those developed from the internal model. Effective P&LA has additional benefits beyond model validation:

- P&LA is a way to demonstrate model use. It can be used to help management understand the variability in profits and losses over different return periods and the capital implications of this.
- It helps provide comfort over the SII balance sheet. The detailed assessment of movements in own funds from period to period provides some additional comfort that the period end balance sheets have been calculated appropriately.

The SII P&LA requirements are expressed at a relatively high level in Article 123 of the Solvency II Directive¹. Whilst the principles are clear there is little detail as to how the process should be carried out in practice.

1. Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of Insurance and Reinsurance (Solvency II) (<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32009L0138>)

Our objectives and approach

In the absence of detailed guidance on how to undertake the P&LA we were keen to understand how firms had approached the task and the challenges they had faced. Our objective was to gain insight into the following:

- The approaches being taken by firms to certain key aspects of the P&LA – high level features were the focus and we did not attempt to delve into the detail of methodology and process.
- The particular practical challenges firms had faced in designing and implementing a robust P&LA.
- How firms had addressed the challenges noted, the lessons learned from this and thoughts on how the P&LA may be developed and improved in future.

To do this, we performed interviews with a number of individuals involved in the production of the P&LA across a sample of life and non-life firms in the UK market.

The material in this booklet is structured to follow the six steps described in Exhibit 1. For each step, we share the working group’s thinking followed by a summary of what we felt were the key points to emerge from our discussions with firms. Finally, we consider briefly some applications of the P&LA results.

Exhibit 1: Steps in developing & performing a P&LA



Conclusions

Our discussions with firms indicated they had developed and executed a P&LA process. In undertaking this work a number of challenges were noted, in particular:

- In designing the process and deciding the level at which to perform the analysis, firms identified a need in some areas to better align the availability of data with the timelines set for the overall process, and granularity of data with the requirements of the analysis proposed.
- Upon performing the analysis and attribution, firms discovered that the volume of analysis required and timescales for its completion had tended to result in a high level of resource being committed.
- In evaluating the results of the exercise and attempting to draw out conclusions and key messages, the relative immaturity of the SII reporting process presented challenges such as setting a reasonable threshold for the untraced². There is a tension here between forcing a low level understanding of risk behaviours versus the practical delivery of what is still not generally an industrialised process.

In terms of the application of the P&LA output for internal model validation, it was noted that it is still evolving. Nevertheless, results so far had provided some comfort over model calibrations with results used to consider aspects such as the reasonableness of risk calibrations and associated loss functions and the identification of new risks.

Extending the use of the P&LA to support broader risk management and business decision making appears largely aspirational at present but is certainly on firms' agendas.

The IMIF Steering Committee recognises the initial challenges the industry has faced in putting a P&LA process in place. Looking forward, while there is still work to be done, we expect that a maturing PL&A framework will increasingly constitute a recognised and valued Solvency II risk management tool. As with other tools, Board level engagement will remain crucial.

2. That part of the result which cannot be explained by the analysis factors considered (also frequently termed the "unexplained").

Introduction

In the post-implementation stage of Solvency II the industry and regulators are turning their attention to some of the areas of the internal model requirements which, whilst necessary for model approval, may have received relatively less attention in the pressurised period in the run up to implementation.

On that list are the P&LA requirements set out in Article 123 of the SII Directive. This requires “insurance and reinsurance undertakings to review, at least annually, the causes and sources of profits and losses for each major business unit”. Firms with approved internal models are required to demonstrate how the categorisation of risk they have utilised in their internal models adequately explains the causes and sources of profits and losses as well as adequately reflecting the risk profile of the business³.

Insurers with approved internal models are expected to demonstrate on-going compliance with the internal model tests and standards. This is a difficult task considering the level of sophistication inherent in some models and a financial and economic context which is challenging and unpredictable. In this context, ensuring that models are credible and the board and regulators remain confident and informed about how they are performing over time is an important and demanding process. The validation process is central to providing the evidence and assurance on which that confidence is built.

The P&LA requirement set out in Article 123 is separate to the validation and model use requirements set out in Articles 124 and 120 respectively. However, it is expected that the P&LA analysis will be used by firms as one of the validation tools to test the reasonableness of areas such as model assumptions and model structure as well as the key function of evaluating experienced risks and associated profits or losses versus those developed from the internal model.

“... insurance and reinsurance undertakings to review, at least annually, the causes and sources of profits and losses for each major business unit.”

3. Article 240 of the Delegated Regulations (<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ.L:2015:012:TOC>) expands on Article 123.

Effective P&LA also has a number of additional benefits beyond validation:

- P&LA is a way to demonstrate model use. It can be used to help management understand the variability in profits and losses over different return periods and the capital implications of this.
- It helps provide comfort over the Solvency II balance sheet. The detailed assessment of movements in own funds from period to period provides some additional comfort that the period end balance sheets have been calculated appropriately.

The SII P&LA requirements are expressed at a relatively high level in Article 123 of the Solvency II Directive. Whilst the principles are clear there is little detail as to how the process should be carried out in practice. In the absence of detailed guidance on how to undertake the P&LA we were keen to understand how firms had approached the task and the challenges they had faced. Our objective was to gain insight into the following:

- The approaches being taken by firms to certain key aspects of the P&LA – high level features were the focus and we did not attempt to delve into the detail of methodology and process.
- The particular practical challenges firms had faced in designing and implementing a robust P&LA.
- How firms had addressed the challenges noted, the lessons learned from this and thoughts on how the P&LA will be developed and improved in future.

We would like to express our thanks to the individuals at those firms who agreed to be interviewed and contribute to the development of this booklet.

Overview of the requirements

Guideline 31 of the EIOPA guidelines on the use of internal models⁴ covers profit and loss attribution but focusses on defining profits and losses.

In the UK, the Prudential Regulation Authority (PRA) has not at the time of writing provided additional guidance around the P&LA process in terms of how it expects P&LA to be undertaken; except that the P&LA processes should be rigorous and the outputs used in a number of other processes. In the absence of detailed SII guidance it was logical that many firms have taken their pre-SII processes, for undertaking analysis of change, as a starting point. From these SII P&LA processes have been developed. In reality this means that insurers will have different starting points and experience of P&LA.

The box below sets out the two key SII Articles which form the legal basis for the P&LA requirements. The scope of the P&LA requirement itself appears to be limited to the identification of sources and causes of historical profits and losses. Beyond that, the validation and use test requirements note the need to apply the P&LA analysis in the validation of the internal model's structure, assumptions and outputs. Thus, an effective and efficient P&LA process will successfully integrate and address aspects of all of these requirements.

Legal basis

Article 123 (Directive 2009/138/EC of the European Parliament and the Council of 25 November 2009)

Insurance and reinsurance undertakings shall review, at least annually, the causes and sources of profits and losses for each major business unit.

They shall demonstrate how the categorisation of risk chosen in the internal model explains the causes and sources of profits and losses. The categorisation of risk and attribution of profits and losses shall reflect the risk profile of the insurance and reinsurance undertakings.

⁴ EIOPA Guidelines on the Use of Internal Models (<https://eiopa.europa.eu/publications/eiopa-guidelines/guidelines-on-the-use-of-internal-models>)

**Article 240
(Commission
Delegated Regulation
(EU) 2015/35 of
10 October 2014)**

- 1.** For the purpose of profit and loss attribution in accordance with Article 123 of Directive 2009/138/EC, insurance and reinsurance undertakings shall specify all of the following:
 - (a) the profit and loss;
 - (b) the major business units of the undertaking;
 - (c) the categorisation of risks chosen in the internal model;
 - (d) the attribution of the overall profit or loss to the risk categories and major business units.
- 2.** The specification of profit and loss shall be consistent with the increase and decrease of the monetary amount underlying the probability distribution forecast referred to in Article 228(1).
- 3.** The categorisation of risks chosen in the internal model shall be adequate, and sufficiently granular, for the purpose of risk-management and decision-making in accordance with Article 120 of Directive 2009/138/EC. The categorisation of risk shall distinguish between risks covered by the internal model and risks not covered by the internal model.
- 4.** The attribution of profit and loss shall be made in an objective and transparent manner and be consistent over time.

The purpose of the P&LA requirement is to test:

- **Model scope** – in considering whether the internal model captures the main sources of profit and loss facing the insurer.
- **Model distribution** – in comparing actual profit and loss against model output the calibration of the model is tested.

It is also seen as an important component of how use of the internal model can be demonstrated.

Internal model firms are expected to reconcile actual profits/losses booked with the internal model outputs to test the extent to which the model output is consistent with the categorisation of the main drivers (sources and causes) of the profits and losses⁵. The process is viewed by some as a special form of back-testing⁶ of actual results against model risk categories in addition to demonstrating whether the outcomes in respect of individual risks are within an expected range. The back-testing process specifies trigger events and predetermined limits which prompt investigations when breached.

If there is a source or cause of profit or loss which is not captured by the model then this suggests that there may be a model deficiency which requires investigation and possible model changes. Moreover, P&LA is a specific test that the internal model should be subjected to as part of the validation requirements. As such, there should be an appropriate P&LA governance and escalation process to ensure there is sufficient oversight of the process. In particular, oversight of how the results of the P&LA analysis feed into the validation and model change processes is important.

The SII requirements stipulate that profit and loss attribution must be carried out at 'Major Business Unit'⁷ level. For most insurers, the major business unit is often too high-level to be informative. Individual insurers need to determine the level of granularity most appropriate for their business and which enables them to achieve consistency with the categorisation of risk in their internal model. For instance, many have found that for underwriting profits using each major class or lines of business is more appropriate.

5. Exhibit 5 provides an illustrative risk classification.

6. Back testing is a process for testing a predictive model using existing historical data.

7. Article 1 (Definitions) of the Solvency II Delegated Regulations (<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2015:012:TOC>):

"in relation to an insurance or reinsurance undertaking, 'major business unit' means a defined segment of the insurance and reinsurance undertaking that operates independently from other parts of the undertaking and has dedicated governance resources and procedures within the undertaking and which contains risks that are material in relation to the entire business of the undertaking;

in relation to an insurance or reinsurance group, 'major business unit' means a defined segment of the group that operates independently from other parts of the group and has dedicated governance resources and procedures within the group and which contains risks that are material in relation to the entire business of the group; and any legal entity belonging to the group is a major business unit or consists of several major business units."

How does P&LA work?

A suggested step by step approach

In order to illustrate how P&LA might be developed and operate in practice a six step process is set out below.

As explained above, there is no prescriptive process which must be followed for P&LA; the suggested approach may however be helpful in enhancing existing processes. The six steps in the process are:



For each step we cover both:

- High level guidance as to what to consider and “how to do it”
- Our findings on how firms are currently carrying this out in practice (“How are firms currently doing it?”)

Step 1: Design the process

The first step in performing P&LA is to establish a process. P&LA requires close liaison between the finance and actuarial teams as well as reconciliation between accounting systems and actuarial models to enable the causes of the differences between profits and losses in the attribution and those in accounting systems to be understood.

As a result, it is vital to plan a process which allows this communication and reconciliation to occur. It is also important to consider which function or functions will provide co-ordination and oversight of the process. This will depend on the current allocation of responsibilities between the functions (finance, actuarial, risk, capital modelling etc.) that play a role in the process both in terms of undertaking and using the outputs of P&LA.

A typical process can be represented graphically (see Exhibit 2) linking the identification and categorisation of risks in the risk register with the categorisation of the risks within the scope of the internal model.

The key inputs into the P&LA analysis are:

- The business plan;
- The internal model outputs which show the distribution of profits and losses expected; and
- The actual profits and losses incurred.

In setting up the process it is useful to consider the following questions:

- Who owns and is responsible for production of the P&LA?
- Who inputs into the process both in terms of its specification and execution?
- How are profits and losses defined?
- How should the SII P&LA work alongside existing GAAP and European Embedded Value (EEV)/Market Consistent Embedded Value (MCEV) analysis and reporting?
- What software tools and IT infrastructure should be used?
- What is the nature of the dependencies between the P&LA process and others such as the internal model validation cycle and model change processes?
- Who are the key stakeholders for P&LA output, what specific information do they need, when and how often?
- How should the results be communicated for example, how is the Executive and Board to be engaged?

Exhibit 2: P&LA – Process overview

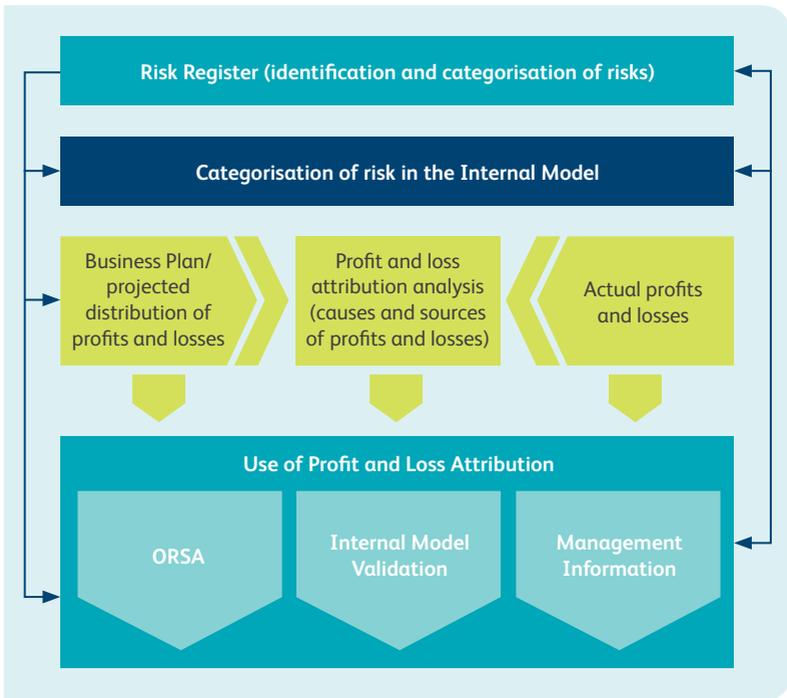


Exhibit 3: Current standards and approaches to P&LA

Process	Most firms are leveraging existing Analysis of Change (AoC) processes. P&LA is encouraging some greater granularity and Pillar 3 deadlines are driving faster production. Existing AoC processes have provided a platform to build from but there is certainly more work to be done.
Granularity	This varies: full alignment to risk driver level for some, higher level for others but with tactical drill-down depending on the significance of different risks rising.
Basis	60 % of our sample of firms were using SII change in own funds, others used GAAP. Some extended their analysis to include changes in the Solvency Capital Requirement (SCR) & Risk Margin (RM).
Frequency	Detailed analysis annually with a lighter touch exercise typically quarterly.
Timeline	Typically around 20 working days for AoC element. This means that analysis results need to be generating significantly earlier, working day 10 or before.
Resource	Has typically been highly resource intensive with significant reliance placed on Subject Matter Experts (SME), which is not viewed as sustainable in the longer term.
Modelling	Some firms are carefully considering how to optimise analysis steps and associated model run schedules to liberate resource and improve the balance between production effort and review.

Many UK internal model firms had established a robust “Analysis of Change” (AoC) process before SII came into force for example, in respect of EEV/MCEV reporting. Firms have subsequently adjusted and extended these processes to give them a firm basis on which to produce the P&LA required under SII.

Despite having a starting point to work from, firms are nevertheless experiencing challenges in aligning existing processes with SII requirements. In particular, it seems that the drive for greater granularity of the analysis in order to align more closely with the risk categorisation within the internal model has resulted in considerable additional work. In some cases, additional ad-hoc analysis has been needed to cover gaps in the established AoC process with judgement being used to focus that effort, for example only investigate operational risk if relevant events are known to have occurred in the period.

A number of firms had adopted a staged approach to the P&LA work with the AoC in the base SII balance sheet the prime focus as a key valuation control. Some firms have a further investigation step, sometimes “out-of-cycle”, to perform a more detailed analysis on the “other explained” category or to further reduce the untraced element. The Risk Margin (RM) was generally considered as a single step change but some firms had intentions to break this down further to provide information to support decision making around possible recalculation of the transitional measure on technical provisions. Some firms were also undertaking, or had planned, an explicit AoC on the SCR.

However, with regard to both the RM and SCR, the ability to perform recalculations of these metrics under varying base balance sheet conditions (to explore the impact of changes in risk exposures) and with different assumptions/model versions was identified as a significant constraint for some.

The final stage of the work considered the attributed results and their underlying drivers against the risk and capital outcomes expected by the internal model to support the validation of the risk distributions and loss functions employed.

Existing AoC processes have provided a platform to build from but the process was still considered to be far from being complete.

Step 2: Decide the level at which P&LA should be performed

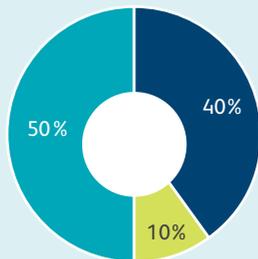
A key part of performing the P&LA analysis is deciding at what level the attribution should be performed.

Depending on how firms are organised, performing P&LA analysis at the level of each major business unit could be too high level and miss the detailed information needed to make the exercise meaningful. However, too detailed a level of granularity can result in the amount of work required becoming excessive and impractical. Too much detail can also create noise which will obscure the key messages from the analysis. Getting the level of granularity right is therefore essential and firms must be comfortable that, whatever level of granularity they adopt, they are in a position to explain and justify their decision.

In practice, using a lines of business segmentation and aligning to the risk categorisation in the internal model can be a good approach to help achieve an appropriate level of granularity. However, it is likely to be a process of trial and error and adaptation to get to an efficient level of granularity. Here are two examples of what that granularity might look like:

Exhibit 4: Granularity – getting the balance right

Example 1: Capital requirements by risk – underwriting risk dominant

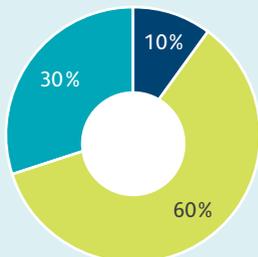


P&L Attribution Granularity

- Underwriting: Motor; Property; Casualty and Health
- Reserve P&C: Motor, Property & Casualty
- Reserve L&H: Health
- Market

● Reserve ● Market ● Underwriting

Example 2: Capital requirements by risk – market risk dominant



P&L Attribution Granularity

- Market: Equities; Property; Government Bonds and Corporate Bonds
- Underwriting: P&C and Health
- Reserve

● Reserve ● Market ● Underwriting

Clearly, it makes sense to focus granularity in areas where the risks are most significant. The insurer in Example 1 might break down underwriting risk between different lines of business. On the other hand, for the firm in Example 2, market risk is dominant and providing a detailed understanding of the drivers of that will be important.

How are firms currently doing it?

The aim has generally been to align the taxonomy of the analysis with the way the business is managed. For a life firm the approach typically considers a breakdown by entity and fund and within that by major lines of business such as with-profit, unit-linked and non-profit. There may be further sub-division below that, depending on materiality, where business is felt to have quite different risk characteristics for example annuity business might be split out from other non-profit business.

For each analysis cell considered, profits/losses are then attributed to risks – an example risk classification is shown in Exhibit 5.

Exhibit 5: Illustrative risk classification (life firm)

Level 1: Market Risk	Level 1: Credit Risk	Level 1: Insurance Risk	Level 1: Operational Risk
Level 2: Interest rate risk	Level 2: Spread risk	Level 2: Longevity risk	Level 2: Regulatory risk
Equity risk	Reinsurer credit risk	Mortality risk	IT risk
Property risk	Other counterparty credit risk	Morbidity risk	Governance risk
Alternative asset risk		Lapse risk	People risk
Currency risk		Expense risk	
Inflation risk			

Exhibit 5 illustrates a risk classification for a life insurer with “Level 1” defining the principal partition of risks and “Level 2” a further breakdown within each partition into different risk types. In many cases firms will go further than this in terms of the risk drivers used within the internal model. For example, taking the highlighted “Level 2” risks, interest rate risk might be broken down into various principal components (typically three) which define the nature of movements in the SII risk-free curve, gilt-spread risk and interest rate volatility risk. The longevity risk class might be further broken down into level and trend risk components.

The analysis does not have to be performed at the individual risk category level but Article 240 of the SII Delegated Acts notes *“The categorisation of risks chosen in the internal model shall be adequate, and sufficiently granular, for the purpose of risk-management and decision-making in accordance with Article 120 of Directive 2009/138/EC”*. Hence, a key consideration is that the P&LA is sufficiently granular to support the risk taxonomy embedded within the internal model and thus, looking at it from the other direction, to enable identification of any material gaps in risk coverage. Such gaps are likely to be indicated by a significant “untraced” element in the analysis.

In terms of the approach being taken by firms, some we spoke to were aiming to address the P&LA at the full level of risk driver granularity employed by the internal model. However, a number of firms noted challenges around aspects such as:

- The additional complexity of analysis and the consequential impact on time and resource
- Availability and reliability of data at the requisite level of granularity

In response, some firms undertook the analysis by considering “Level 2” risks as a starting point but then used supplementary management information such as the output from daily solvency monitoring systems to help highlight, in advance, lower level risks likely to be worthy of explicit consideration for the current P&LA cycle.

Firms are being pragmatic around the granularity of the P&LA; some are analysing at full risk driver level while others are taking a targeted approach.

Step 3: Define the basis of profits and losses to be used

Article 123 of the SII Directive does not set out which definition of profits and losses the P&LA process should use. Examples of possible options include:

- a.**
SII basic own funds.
- b.**
Internal definitions for economic profits and losses.
- c.**
Profits/losses reported on an IFRS basis in the accounts.
- d.**
MCEV profits and losses disclosed in addition to the financial statements reported by some undertakings.

However, it is clear from Article 240 of the Delegated Acts that (a) is the definition which most obviously meets the requirement that “*the specification of profit and loss shall be consistent with the increase and decrease of the monetary amount underlying the probability distribution forecast referred to in Article 228(1)*” i.e. SII basic own funds. The expectation is that the definition of profits and losses used for the P&LA would also be used to meet the use test requirements so would have to be appropriate for systems of governance (including the ORSA, risk management, limit setting and capital allocation processes). The variable defined as profit for the P&LA may differ from basic own funds as a different internal definition may be used for economic capital resources. For example, the RM may be excluded or a different risk-free interest rate curve employed. In that case, firms must be clear how the profits and losses used in the P&LA analysis may differ from the profits and losses reported in the accounting system and the reasons for these differences.

Source: EIOPA Guidelines on the Use of Internal Models (<https://eiopa.europa.eu/publications/eiopa-guidelines/guidelines-on-the-use-of-internal-models>)

Guidelines on the Use of Internal Models; Chapter 8 Profit and Loss Attribution; Guideline 31 Definition of profit and loss

1.73. The insurance or reinsurance undertaking should consider profit and loss as changes over the relevant period in:

- a) basic own funds; or
- b) other monetary amounts used in the internal model to determine changes in basic own funds, such as the actual change in economic capital resources.

To this end the profit and loss attribution should exclude movements attributable to the raising of additional own funds, the repayment or redemption of those funds and the distribution of own funds.

1.74. When it uses a variable other than the basic own funds in its internal model, the insurance or reinsurance undertaking should use this variable for the purposes of profit and loss attribution.

1.75. The undertaking should identify through the profit and loss attribution how changes in the risk drivers relate with the movement in the variable underlying the probability distribution forecast.

How are firms currently doing it?

Our discussions with firms noted a strong tendency on the life side to define profits and losses as the change in SII basic own funds over the relevant period. However, on the non-life side there appeared to be a greater use of GAAP (we note the Lloyd's guidance⁸ specifically allows for the use of GAAP profits). Using GAAP profits has some significant advantages in that it allows existing result analysis exercises to be quickly adapted; also, as the business typically "talks" a GAAP language, the results can be more useful too. It does not however provide the additional comfort on the SII balance sheet and is more suitable in non-life firms who only have limited differences in profit recognition between SII and GAAP. The decision on whether GAAP is appropriate as the basis for SII P&LA will be firm specific and may change over time as the SII reporting process matures.

8. Lloyd's Solvency II Detail Guidance Notes state the following regarding the definition of profits and losses: "The level 2 text does not set out which definition of profit and loss should be used (e.g. the reported GAAP accounts or an internal measure of economic profit/loss), however managing agents may find it helpful initially to reconcile back to the declared GAAP earnings statement, adjusted for discounting and profits on unearned premiums where appropriate. CEIOPS' advice is to use internal definitions for profits and losses which should be consistent with the variable underlying the probability distribution forecast. This would suggest measurement against a measurement of "economic" profit rather than the current GAAP reporting basis. This may pose difficulties for firms which currently do not measure themselves internally on an economic or similar basis."

Step 4: Understand potential sources and causes of profits and losses

Profits and losses come from a variety of sources and there can be many causes of variability in relation to each source.

Exhibit 6: Illustrative breakdown of the sources and causes of profits/losses

Possible sources	Example internal model risk classifications & associated possible causes	Model related explanations for variance between actual and expected (model)
Underwriting divisions or lines of business (Underwriting/Pricing)	<ul style="list-style-type: none"> • Cat risk: earthquake, tsunami, epidemic • Longevity risk: radical new medical treatments • Underwriting risk : higher/lower premium rates, tightening of underwriting/pricing controls • Lapse risk: reputational issues, replacement products, change in legislation 	<ul style="list-style-type: none"> • Model error • Parameter error • Experience variability • Risks not captured • Poorly calibrated/ inaccurate business plan assumptions
Investment over or under performance (Finance/Treasury/ALM)	<ul style="list-style-type: none"> • Rate risk: change in level/shape of nominal risk-free yield curve • Spread risk: increase in spreads on corporate bonds • Equity risk: significant rise in equity markets 	
Commission costs and admin expenses (Finance)	<ul style="list-style-type: none"> • Expense risk: unexpected one-off costs, complex-to-model override commissions 	
Reserve deterioration or improvement (Reserving + Claims)	<ul style="list-style-type: none"> • Reserve risk: potential impact of UK courts changing approach to periodic payment settlements • Reserve Risk (active claims management) 	

It is very helpful, in advance of performing the attribution exercise, to consider the potential sources and causes of profits and losses. The existing Own Risk and Solvency Assessment (ORSA) is a useful input into this preparatory work. Doing this helps improve the quality of the attribution process, it also helps align it to the way in which profits are defined and risks are measured. For instance, thinking about potential sources and causes of profits and losses is another way of understanding potential risks and also provides a “library” of potential causes (to make the attribution process easier).

How are firms currently doing it?

The firms we talked to clearly utilise knowledge of sources and causes of profits and losses from processes such as business planning and ORSA to inform their understanding of the causes and sources of profits in their P&LA process. However, it is not clear the extent to which insurers leverage these existing processes to inform their P&LA by directly linking these processes in terms of timing, consistency of outputs and feedback loops. Mature P&LA processes will be those that explicitly create these linkages.

Step 5: Perform the attribution at the selected level

It is only when the attribution is completed that the causes can be assessed for their impact on the model, risk profile and original model calibration.

If unattributed losses are large enough, this may indicate an original model error in the base expected result. Exhibit 7 provides an example of attribution being performed for motor underwriting risk for a personal lines motor insurer.

Exhibit 7: Example attribution – motor underwriting risk

Frequency: Annual	£m	
Expected profit (loss) per the internal model	0.5	
Rate rises beyond expectation	2.0	
Increased claims frequency (parameter)	-1.0	
Untraced	0.25	
Actual profit (loss)	1.75	
Tolerance level for untraced	0.5	
Actual profit (loss) expressed as a percentile of the internal model loss distribution	25th percentile	
Commentary:		
<p>The period saw large rate rises beyond expectation following some medium sized writers withdrawing from the market. This was not foreseeable but deemed to be acceptably treated by the model as there can be a number of drivers of higher than expected profits. Offsetting this is higher than expected claims frequency – upon investigation it was concluded that the business plan (and so therefore model) should have foreseen this based on the prior year change in business mix. This represents a business plan parameter error which will be updated in both the model and business plan.</p> <p>Pass/fail considerations:</p> <p>The untraced of £0.25m was not successfully attributed but was within tolerance.</p> <p>The actual profit (loss) fell on the 25th percentile of the internal model loss distribution. This outcome does not explicitly indicate a pass or fail but the result was considered broadly reasonable at the 1 in 4 year level.</p>		
Result indicates model deficiency/unidentified risk?	No (once parameter adjusted)	
Reviewed by	Financial Director	

How are firms currently doing it?

The following sections cover a number of dimensions to this question.

Analysis structure & frequency

For some firms we note there may be additional drivers for the reporting frequency beyond the SII regulations e.g. capital market requirements.

In terms of analysis frequency, firms are producing the P&LA at least annually with many analysing movements quarterly, albeit at a less detailed level than for their annual analyses. In addition, many firms noted that they were not yet where they wanted to be in terms of the balance between the time spent on producing the analysis and the time spent on review, challenge and application of the results.

Exhibit 8: Illustrative P&LA cycle

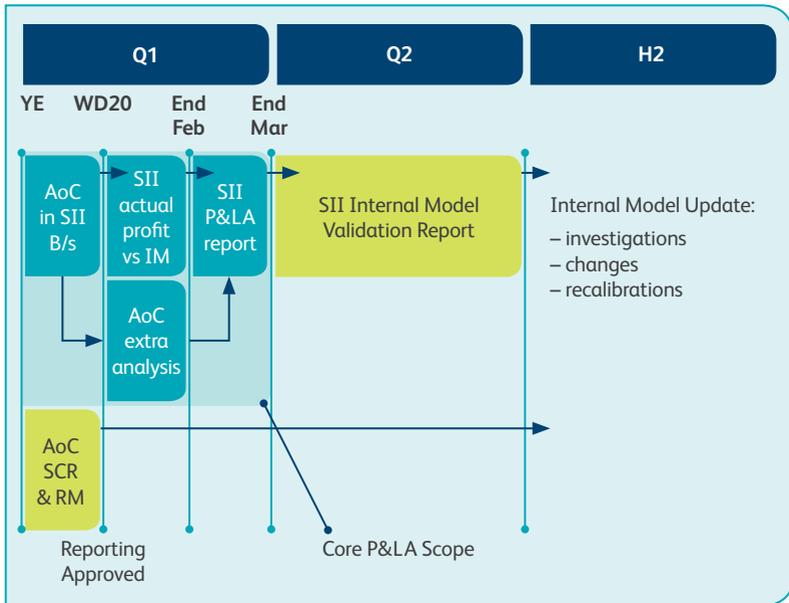


Exhibit 8 provides an illustration of the key process steps which comprise the core scope of the P&LA and when these are likely to be executed. Other related activity is also shown to highlight the expected interactions with other key processes. Some points to note:

- AoC in SII balance sheet – if a Working Day (WD) 20 target is set then this implies a much shorter period for the production activity – likely WD10 or even earlier. However, it is possible that further analysis is performed after this but pre-submission e.g. to provide additional comfort around the nature of items in the “other explained” category and to further reduce the “untraced”.
- AoC for the SCR and RM is not within the core scope of the P&LA but may be undertaken at the same time as the work to verify the base SII balance sheet. The outcome of this work would be expected to feed into the process of internal model review and determining the new RM and SCR.

Modelling

The number of model runs or manual calculations required to produce a complete and granular P&LA split by risk category can be onerous, particularly for firms which require stochastic modelling of cash flows. Firms have put considerable effort into designing approaches which minimise the burden of run times; some explicit examples of actions firms have taken include:

- Setting the order of analysis in a manner that enables some runs to be undertaken before WD1. For example, runs which address opening adjustments such as model changes are a clear candidate for production in advance. For life firms, advance production can also be applied to runs needed to analyse demographic assumption changes.
- A further benefit of advance production is that results can be aligned with those which have already been through internal governance for other purposes. For example, if demographic assumptions are set based on Q3 results then considering the impact of such changes in the Q4 P&LA based on the opening balance sheet position should provide results consistent with those already reviewed and signed-off by senior management and the board. This helps avoid the need for additional rounds of explanation and reconciliation. Clear communication is important though to ensure all stakeholders understand the basis for the analysis – in the example here, the Q4 actual versus expected for demographic risks will be measured against the new assumptions not the old.

- Some noted that certain inputs into the modelling process can be time consuming to produce – an example was the calibration and generation of revised sets of economic scenarios. In such cases, firms have sought to cut down the workload by combining market movements into a smaller number of recalibration exercises. For example, recalibrating for movements in interest rates may not need to be broken down into the principal components.
- Making use of management information, such as output from daily solvency monitoring systems, to inform which market risks are material drivers of results for the period – the run schedule for the P&LA can then be filtered appropriately. In a neat synergy between these processes, the P&LA can also provide a useful validation check on the calibration of the daily solvency monitoring system.
- Where appropriate, using manual calculations or approximations outside of the actuarial modelling system to estimate the impact from certain movements.

Model run schedules and associated processing times in support of P&LA can be onerous. Nevertheless, careful design of the analysis process and leverage of complementary systems can provide significant mitigation.

Resourcing and data

A strong common theme from the discussions we had was that, thus far, production of the P&LA is a resource intensive process. Firms noted they were delivering the P&LA but were drawing on significant amounts of time from key subject matter experts (SME) to do so. The level of current resourcing required for the P&LA activity was generally felt to be unsustainable in the longer term and addressing this was noted as a key priority.

The issues driving the heavy resource requirement vary between firms. Some themes which emerged from our discussions are:

- In many cases, the P&LA process is still far from an automated end-to-end activity. Manual process steps are required along with the definition and execution of ad-hoc analyses. These activities can require significant SME resource with the necessary experience and judgement.

- Other issues relate to the immaturity of the SII reporting process:
 - Thresholds for the “untraced” element of the AoC set in advance have proved challenging to meet with the result that additional work has been needed. It was noted that setting low levels of tolerance for the untraced had the advantage of driving a low level understanding of risk behavior. However, against that were the practical considerations of getting the analysis done in a reasonable time and with available resources.
 - Gaining comfort over the nature of items classed as “other explained” i.e. to establish if these are really one-offs or perhaps indicative of gaps in the coverage of the model
 - the work needed to support such judgements can be time consuming in particular as it may be bespoke to the points arising in each period. One firm noted that they felt performing the analysis more frequently e.g. quarterly would help, as it would allow events to be reviewed closer to their occurrence and there would be fewer events to consider in each round of analysis.
 - In some cases, challenges were noted in terms of the effort needed to distil what can be a complex and detailed set of results into something meaningful for a senior audience. As the granularity of the analysis becomes greater and more information becomes available there is a commensurate increase in the work needed to translate this into clear and concise messages for onwards communication. Failure to do this well runs the risk that the P&LA becomes perceived as a mostly technical exercise with little broader benefit to the business.

In relation to data, issues were noted in sourcing accurate and consistent data in some areas, with difficulties often being exacerbated by level of granularity required. A particular area noted was in relation to sourcing asset valuation data at a sufficiently detailed level. Problems were also noted with regard to demographic data on the life insurance side where firms can face legacy system challenges in terms of inconsistent classifications of movements between different administration systems.

P&LA activity has placed a significant strain on resources. Improvements are needed quickly to make the activity sustainable in the longer term.

Step 6: Evaluate the results

The final step in the P&LA cycle is the evaluation and analysis of the attribution. A good attribution process will include consideration of the impact on the internal model and business plan.

The output from an effective P&LA will provide a valuable contribution towards the goal of understanding the drivers of profits and losses and how these relate to the original risks assumed. The evaluation and analysis step is important because this is where the firm forms a view about the messages and conclusions, recommendations and actions that can be reached from the attribution. At a high level the questions insurers should be asking themselves include:

- What does it indicate about the achievability of the original business plan?
- What does it indicate about the assumptions underlying the business plan and the internal model?
- What does it indicate about the internal model in terms of risk coverage and adequacy of the modelling approach and expert judgements?

How are firms currently doing it?

Industrialisation of the process and modelling infrastructure was a recurring theme of the interviews with firms. Process improvements were also expected to provide an improved balance between the time required for production and that available for evaluation and analysis of the results of the attribution.

Future developments

There was general consensus that the P&LA process is in its early days for the majority of firms and there were many areas identified where further development is expected.

Particular areas which emerged from our discussions with firms included:

- Industrialisation of the process and modelling infrastructure – a recurring theme of the interviews with firms was the need for further industrialisation of the process and the need to be able to produce results more quickly and efficiently with less reliance on manual intervention. Process improvements were also expected to provide an improved balance between the time required for production and that available for investigation and review.
- Looking at ways to cascade some of the knowledge required from SMEs to other staff to enable the P&LA to move onto a more genuine business as usual footing.
- Addressing conflicts – P&LA involves multiple areas in the business and this can pose challenges in terms of coordination, communication and managing different sets of stakeholder priorities. One response to this being contemplated is to develop a “P&LA Champion” role at a senior level.
- Exploiting synergies with other processes – for example using the P&LA as a check on the calibration of a daily solvency monitoring (DSM) system but also using DSM to indicate the key market risks in play for the current period and thus provide advance notice of some likely key risks for the next P&LA exercise.
- The impact of IFRS 17 – generally this was seen as positive – since it would allow the valuation bases between GAAP and SII to be far more closely aligned – making a single result analysis/P&LA process easier to achieve.

Application of P&LA results

The earlier part of the paper has focused on the production of the P&LA.

This section considers briefly what happens after the P&LA has been generated in terms of the different areas where the output of the analysis may be used.

Validation of the internal model

Article 242 (Validation tools) of the SII Delegated Regulations explicitly refers to the use of the P&LA for model validation:

“As part of the testing of the internal model results against experience insurance and reinsurance undertakings shall compare the results of the profit and loss attribution referred to in Article 123 of Directive 2009/138/EC with the risks modelled in the internal model.”

In terms of how the P&LA output can be used:

- In some cases a direct link can be made to compare actual realisations of risk drivers with the risk calibration in the internal model. For example, the actual return on equities can be compared with the modelled risk distribution to establish the expected likelihood of that actual event. For other risks it will be more difficult to translate actual experience into an implied level of the associated risk driver(s). Lapse experience for example can exhibit a complex picture perhaps varying markedly across products and in-force durations. However, whilst it might be a natural part of the P&LA to consider the drivers of attributed profits/losses, the monitoring of emerging experience across the risk universe covered by the internal model is not particular to this exercise and should already be part of the regular review of the internal model calibration.
- An area where the P&LA output can provide additional information is in considering how well the internal model predicted the profit/loss which actually occurred given the specific realisation of the associated risk driver. So if the actual total return on equities was, say, – 10 % last year when the P&LA outcome for this risk was a loss of £50m, then a modelled loss of only, say, £25m for the same event may raise concerns and prompt further investigation.

Wider applications

In 2009 the EIOPA predecessor, CEIOPS published its advice for Level 2 Implementing Measures on SII. This included the expectation that the results of P&LA analysis would provide information that would be used for the system of governance (including the ORSA,

risk management, limit setting, allocation processes). The implication was that P&LA was very important element in demonstrating compliance with the internal model use test. Since 2014 the PRA has indicated in at least two separate publications how it expects P&LA analysis to be used by internal model firms; two examples are set out in the box below.

PRA expectations of the uses of P&LA:

As input into the process for ensuring clear feedback loops exist between underwriting, claims and reserving:

“Ensure clear feedback loops exist between underwriting, claims and reserving. For example, regular monitoring and reporting of actual compared to expected and clear key performance or risk indicators that flag the need for more detailed assessment and allow boards to take appropriate and timely action if required. For internal model firms we also expect profit and loss attribution under Solvency II to be a valuable tool in providing information for, and supporting, the feedback loops.”

(Dear CEO Letter, Continued soft market conditions in the UK general insurance sector, Chris Moulder Director of General Insurance Supervision, 4 December 2015)
<http://www.bankofengland.co.uk/pradocuments/about/insuranceletter041215.pdf>

For providing evidence of how surplus has arisen in relation to the Matching Adjustment (MA) portfolio:

“In their [MA] applications, firms will be required to describe the process by which they will maintain the MA portfolio on an ongoing basis. The PRA expects the governance process around any extraction of surplus to be robust, and to include:

- a. an assessment of the firm’s ability to continue to meet the MA requirements post-extraction;*
- b. a rigorous profit and loss (P&L) attribution for the MA portfolio that clearly shows how the surplus has arisen (i.e. that it has arisen due to a change in either the expected asset or liability cash-flows); and*
- c. clear threshold(s) for assessing whether a change in cash-flows is ‘material’.”*

(Solvency II: Matching Adjustment Letter section on the extraction of surplus in relation to applications for Matching Adjustment, Paul Fisher Executive Director, Insurance Supervision, 15 October 2014)
<http://www.bankofengland.co.uk/pradocuments/about/pralletter280315.pdf>

How are firms currently doing it?

Given the relative immaturity of SII P&LA processes it is not surprising that firms have tended to focus thus far on the most pressing application, supporting the validation of the internal model. The firms we spoke to are certainly alive to the broader business benefits of wider applications and as the P&LA processes mature there should be greater opportunities to realise these benefits.

Using the P&LA to assist with identification of new risks was sometimes seen as challenging with work required to verify if “other explained” items are really one-offs or possibly indicative of gaps in the universe of modelled risks. Some felt that formal thresholds for the acceptable level of untraced within the P&LA analysis might be driven lower over time to help identify new risks earlier. Some firms are tracking the history of P&LA results and one noted that a persistent level and direction of untraced might prompt further investigation even if below a formal threshold.

Another pragmatic use of the P&LA for model validation is to compare actual experience with the outputs of any sensitivity/scenario testing previously carried out. One firm had successfully used their P&LA results to confirm that sensitivities they had produced were accurate and gave outcomes consistent with experience.

Overall, most firms noted that results so far provided at least some positive assurance that internal model calibrations were not unreasonable. One firm noted that the P&LA had been useful and prompted them to investigate the results for a certain risk in more detail. However, the general sentiment was that, so far, the use of P&LA output to help validate the internal model had provided modest added value – though it is readily acknowledged that it is too early to draw any firm conclusions.

Appendix 1:

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Commission Delegated Regulations supplementing Solvency II Directive (EU) 2015/35 (<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJL:2015:012:TOC>)

EIOPA Guidelines on the Use of Internal Models (<https://eiopa.europa.eu/publications/eiopa-guidelines/guidelines-on-the-use-of-internal-models>)

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Dear CEO Letter, Continued soft market conditions in the UK general insurance sector, Chris Moulder Director of General Insurance Supervision, 4 December 2015 (<http://www.bankofengland.co.uk/prd/Documents/about/insuranceletter041215.pdf>)

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The Internal Model Industry Forum

This document has been produced by the Internal Model Industry Forum (IMIF). The Institute of Risk Management (IRM) set up the IMIF in 2014 to address the key questions and challenges that insurers face in the use, understanding and validation of internal risk models. It is designed to work in a collaborative way to develop and share good practice to ensure that these models add value to the organisation and support regulatory compliance. IMIF now has over 400 members and we have run a series of Forum meetings to explore key issues. A number of workstreams are also undertaking research and we aim to publish the results along with other useful resources and guidance.

As the leading organisation promoting education and professional development in all aspects of risk management, IRM is pleased to be able to support this industry initiative to share good practice.

More information about the IMIF and its work can be found on the IRM website www.theirm.org/imif

Who are the IRM?

This work has been supported by members of IRM, which has provided leadership and guidance to the emerging risk management profession for over 30 years. Through its training, qualifications and thought leadership work, which includes seminars, special interest and regional groups, IRM combines sound academic work with the practical experience of its members working across diverse organisations worldwide. IRM would like to thank everyone involved in the IMIF project.



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