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Reserving - how to reserve an Engineering portfolio with its specific characteristics

PartnerRe

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Working Group Paper Content

Introduction

Definitions

- Reserving terms
- Premium terms

Reserving methods

- Development triangles
- Expected claims technique
- Bornhuetter-Ferguson method
- Others

Appropriate earning methodology for an engineering portfolio

- Importance of an appropriate earning methodology
- Considerations on construction engineering policies iro exposure evolution
- From the exposure to an earning pattern
- Application to a master policy / reinsurance treaty (portfolio of policies)

Intention of the paper

- The paper gives underwriters insight into the actuarial world of how to reserve an engineering portfolio with its specific characteristics.

- The objective of the group is not to give recommendations to insurers how to reserve claims of engineering portfolios, but provides understanding and ideas in practice and theory.

- The paper describes some of the standard reserving concepts and emphasizes about accurately measuring earned premium in particular for medium to long tail business (CAR/EAR)

- The aim of the paper is as well to promote a closer interaction between underwriting and actuarial functions for Engineering business affaires.

Why is correct and accurate reserving important?

- **Policy holders expect claims to be paid**

  - The moment at which the claims are paid doesn't correspond to the one at which the premiums are received
  - Therefore the insurance company has to take into account these future liabilities (claims liabilities) setting up appropriate reserves in the balance sheet in the appropriate period

- **Owners/Shareholders don’t like volatility in results**
  - Under-reserving leads to higher profits in the short-run and reduced profits in future

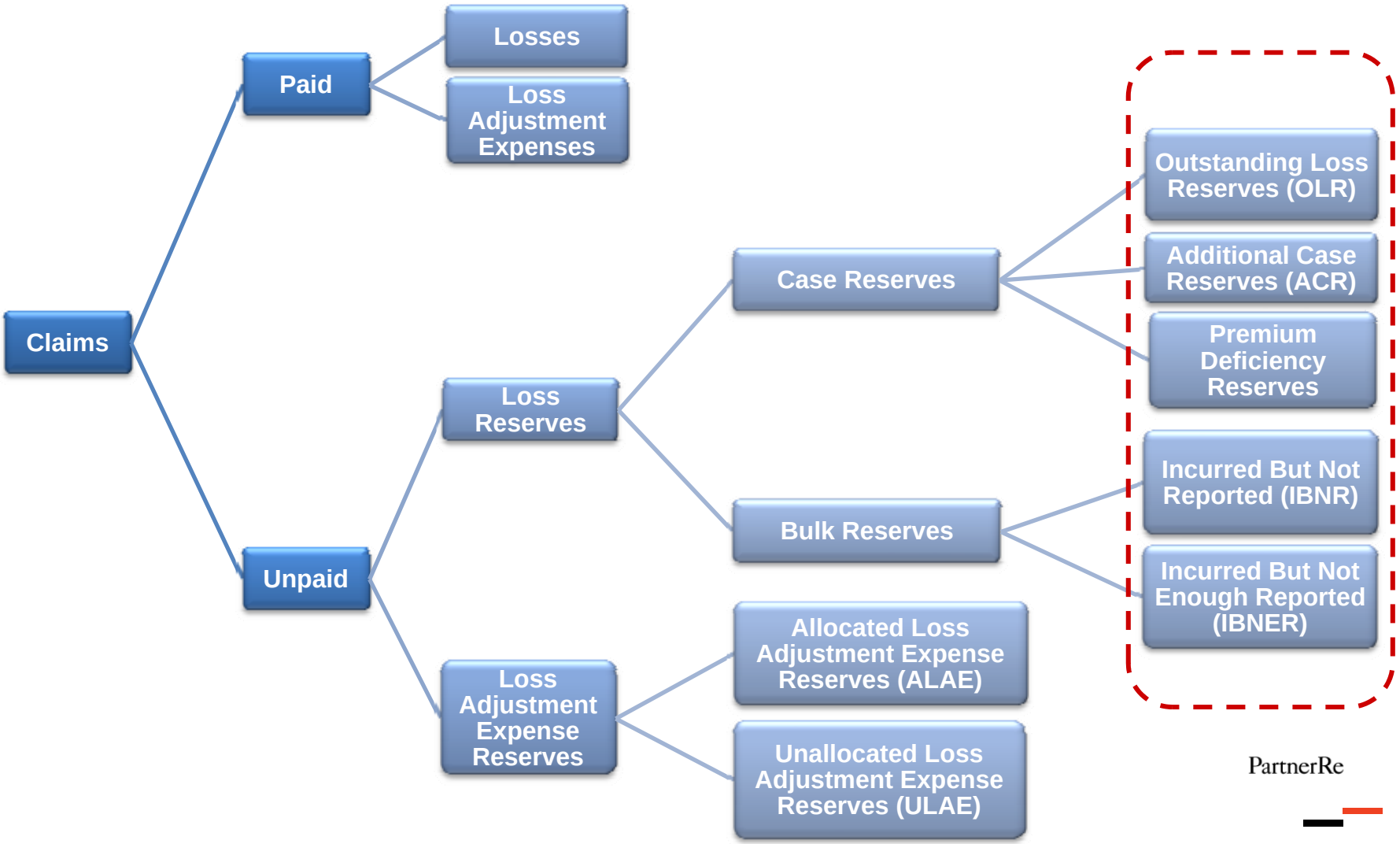
Why is correct and accurate reserving important?

- **Supervisory Authorities**
  - Requirements in order to assure claims payments to protect consumers and avoid insolvency of insurers
  - US-GAAP - Basic Principles (FAS 60)
    - Premiums are recognised in the income statement (earned) in proportion to the insurance coverage provided (risk)
    - Acquisition costs are deferred and recognised as the corresponding premiums are earned
    - Claims are recognised when they are incurred
- **Tax regulators**
  - Profits result in tax revenues

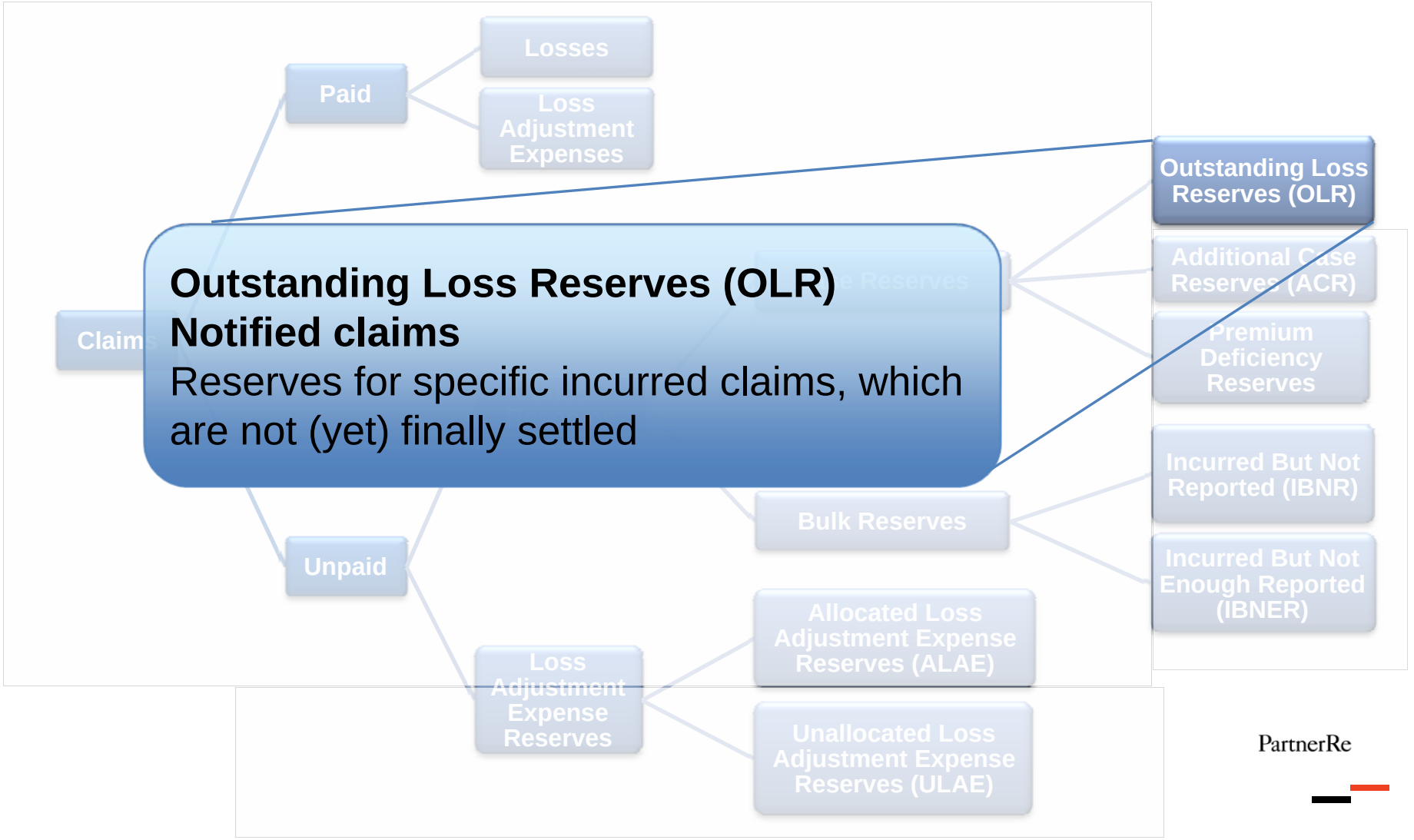
Balance Sheet / Income Statement

Balance sheet	Income statement
Assets Liquidity Assets Receivables DAC **Liabilities** Claims reserves Payables UPR Premium def. reserves **Capital**	**Profits** + Premium earned + Income on investment – **Losses** - Paid losses - Changes in reserves - Commissions - Operational expenses **= Result**

Graphic Illustration of claims



Reserving terms definitions (1)



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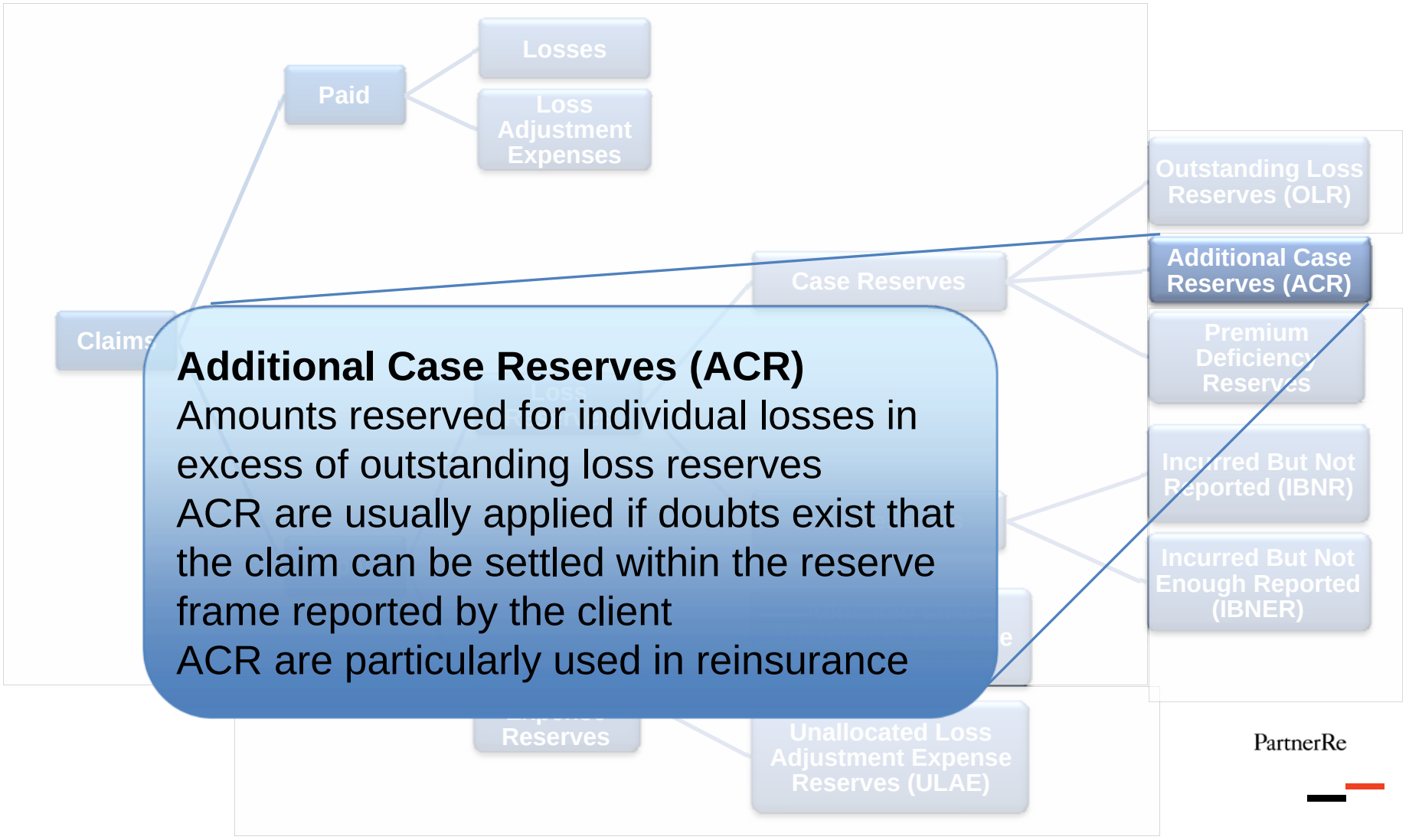
Reserving terms definitions (2)



Additional Case Reserves (ACR)

Amounts reserved for individual losses in excess of outstanding loss reserves

ACR are usually applied if doubts exist that the claim can be settled within the reserve frame reported by the client

ACR are particularly used in reinsurance

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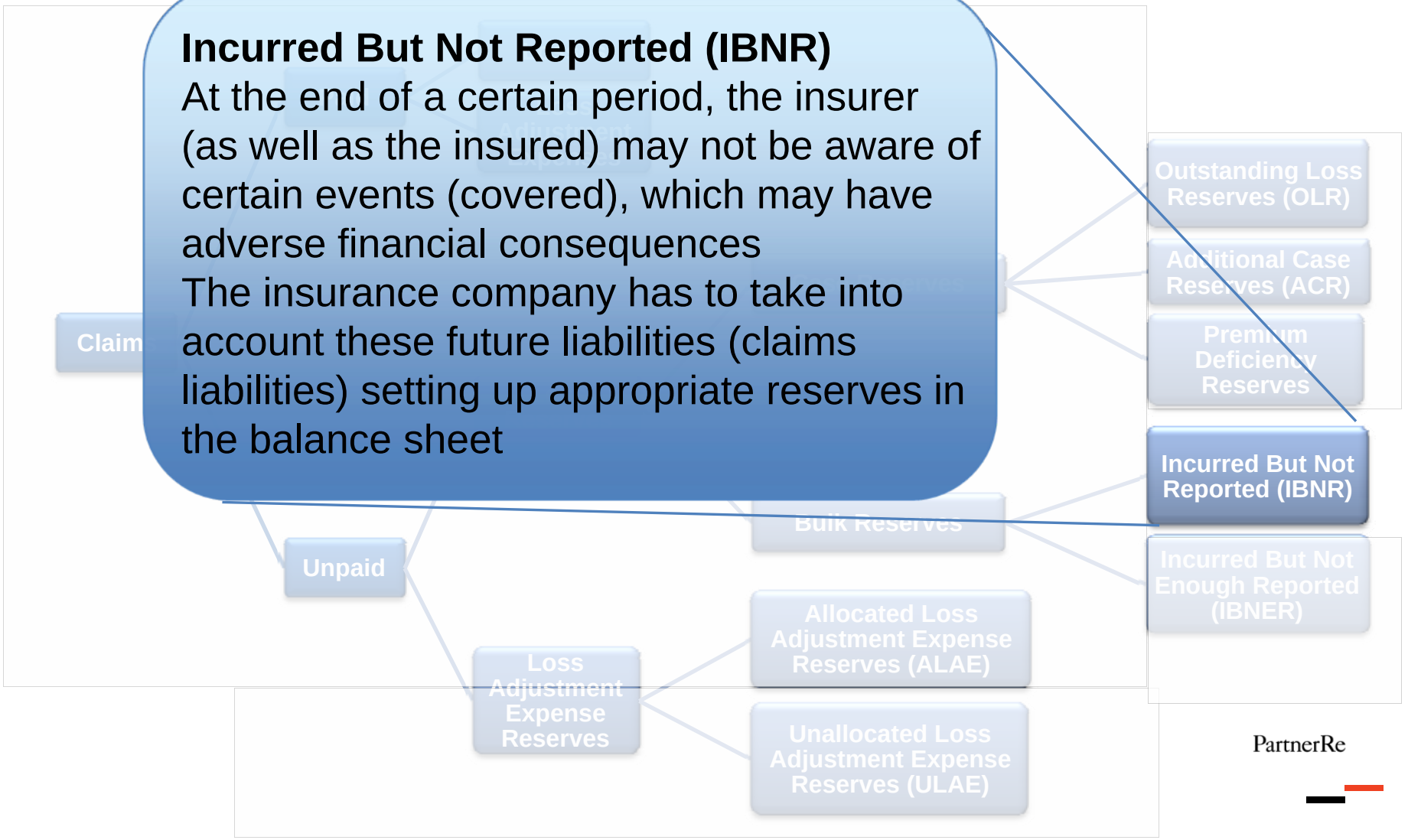
Reserving terms definitions (3)

Incurred But Not Reported (IBNR)
At the end of a certain period, the insurer (as well as the insured) may not be aware of certain events (covered), which may have adverse financial consequences
The insurance company has to take into account these future liabilities (claims liabilities) setting up appropriate reserves in the balance sheet



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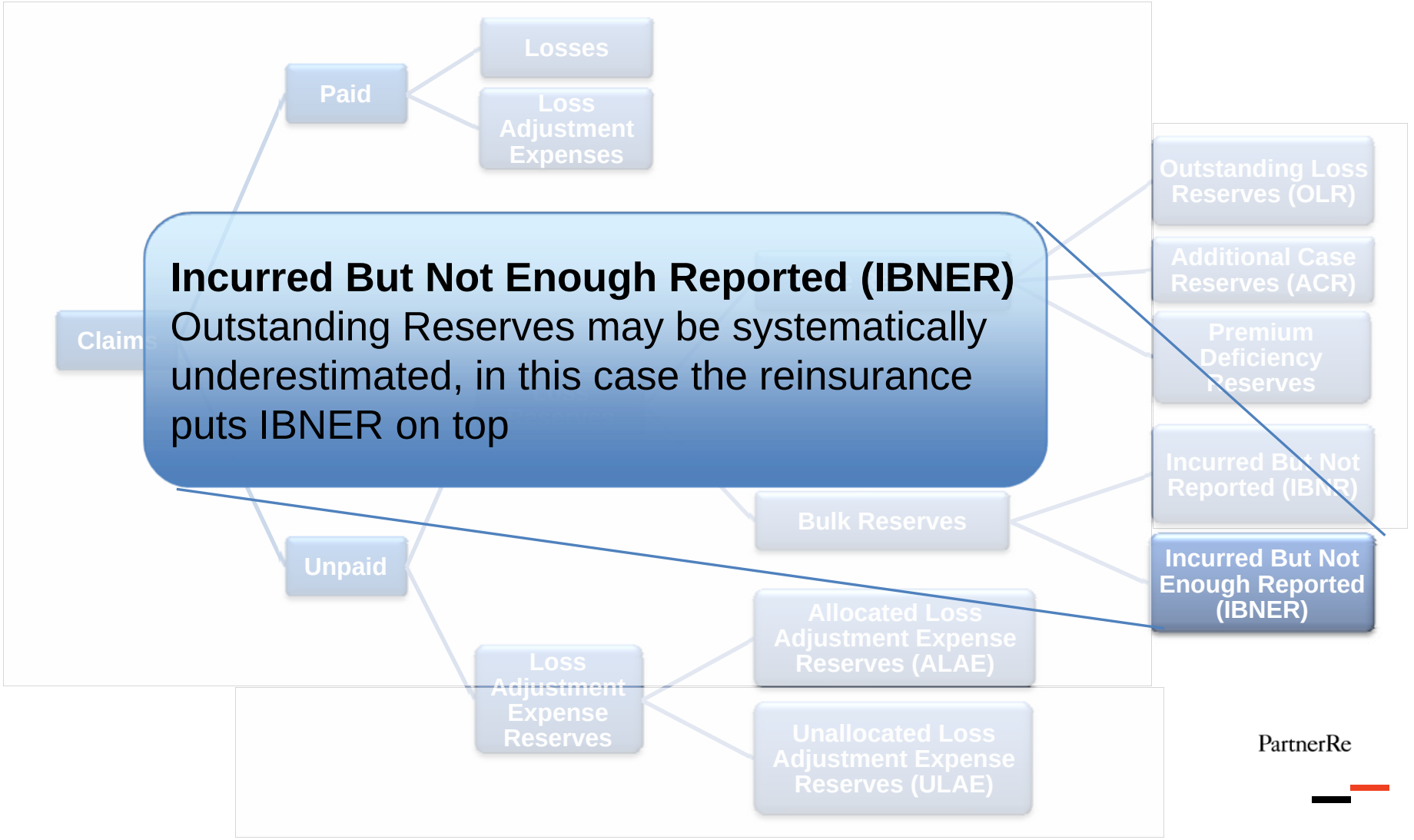
Reserving terms definitions (4)



Incurred But Not Enough Reported (IBNER)
Outstanding Reserves may be systematically underestimated, in this case the reinsurance puts IBNER on top

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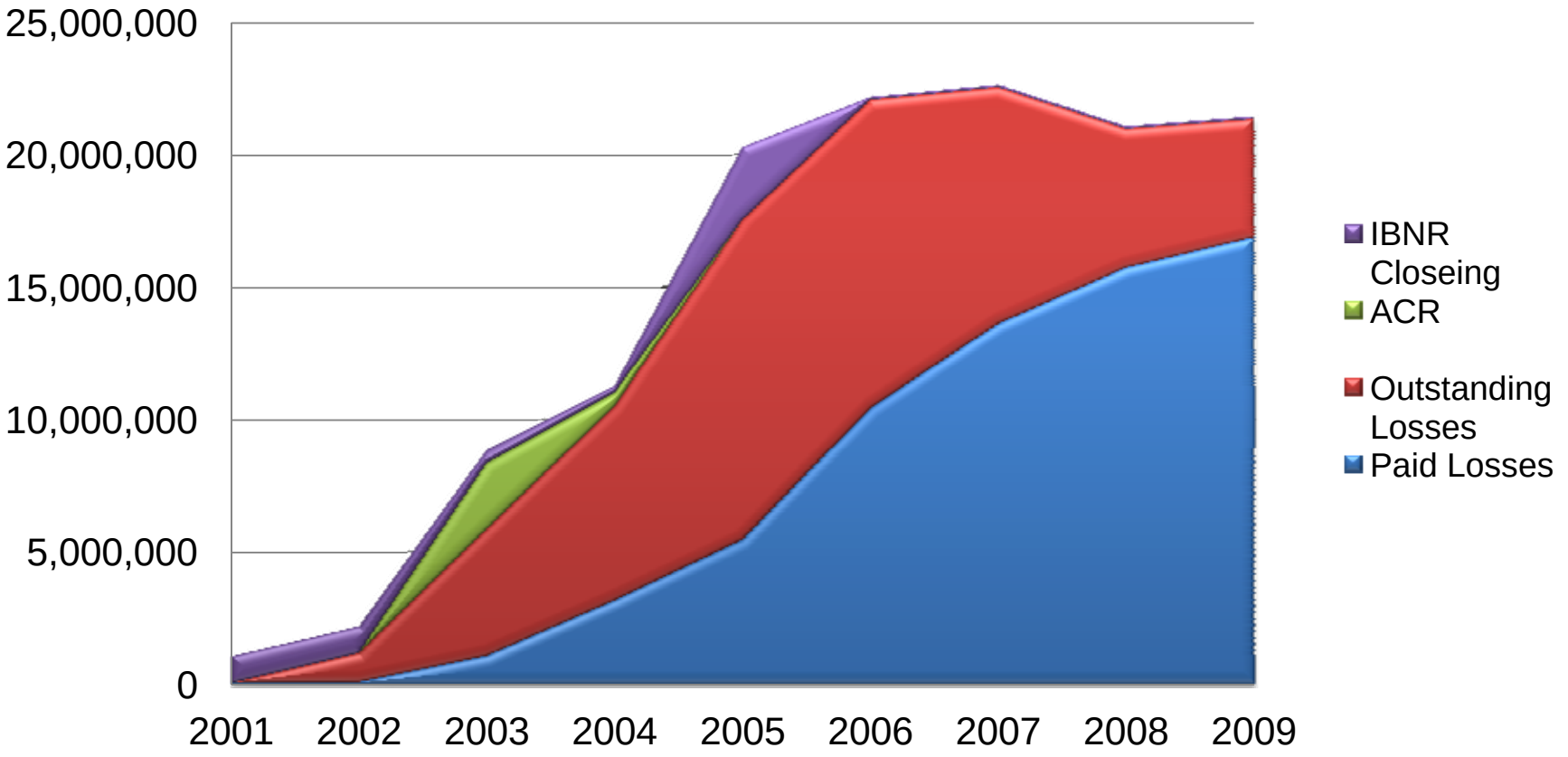
Claims Development Example of CAR/EAR Portfolio
UWY 2001 / Cumulated View



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Premium terms definitions

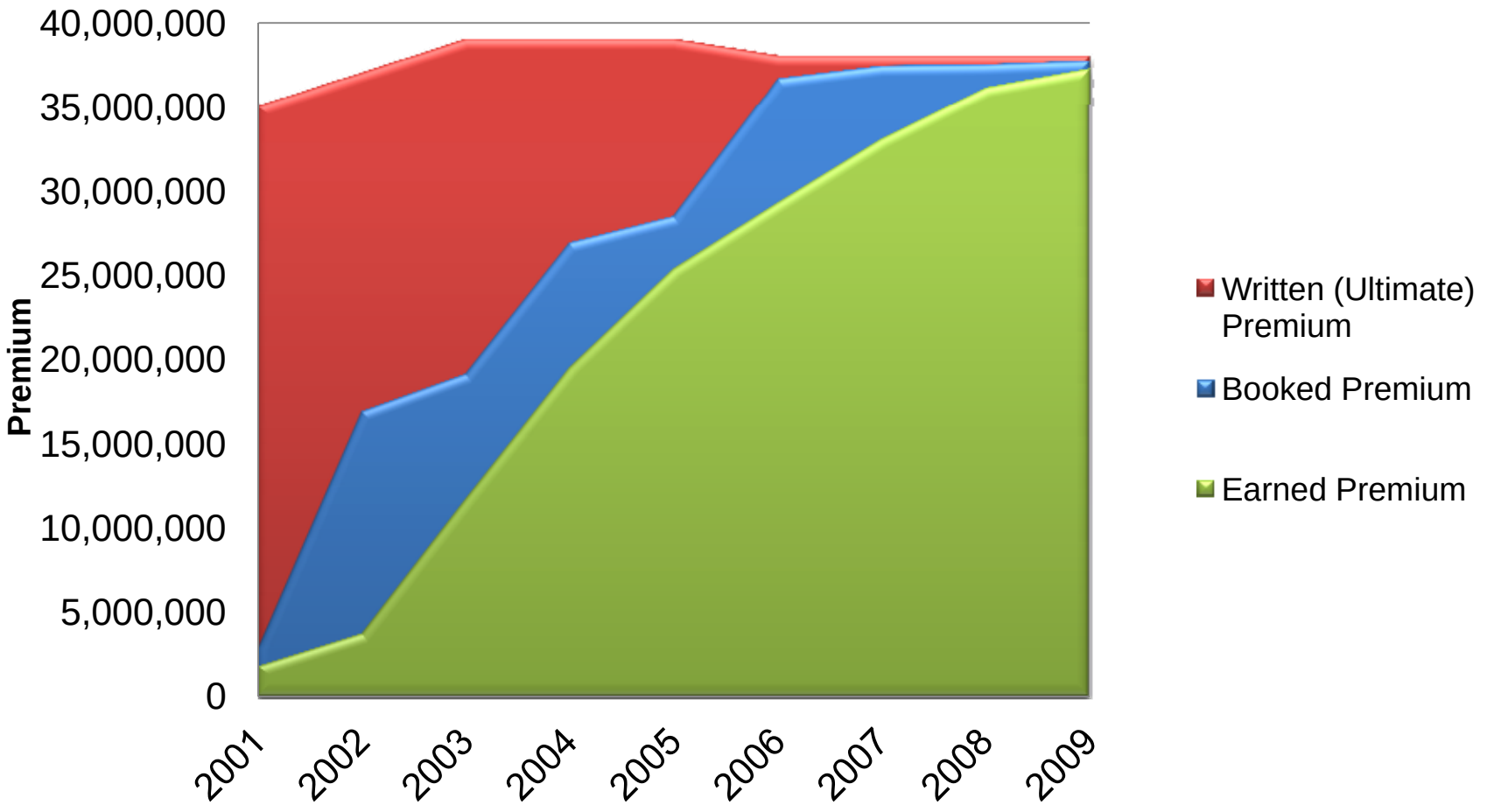
Written Premium
- Premiums for all policies sold during an underwriting period
- Sum of all premium amounts stated on the policies written for one portfolio during a defined period (e.g. UWY)

Accounted or Booked Premium
- Booked premiums during a specific accounting period

Earned Premium
- Premium recorded as revenue during a specific accounting period
- The earned premium is risk/exposure based. It represents the consumed part of the risk of a portfolio

Unearned premium reserves (UPR)
- Premium written for future financial periods and carried over to the next period's financial statements. This is essentially the difference between written but not yet earned premium

Premium Development Example of CAR/EAR Portfolio
UWY 2001



Reserving Methods

- Methods described in the paper
  - Chain Ladder Method
  - Expected claims technique
  - Bornhuetter-Ferguson Method
- Other methods
  - Benktander
  - Cap Cod
- Data
  - Development triangles
    - In the following discussion we will use as our example, data on reported claims. Similar analyses can be performed on paid claims, case outstanding, reported claim counts, etc. For most reserve analyses, at the very least, triangles for both paid claims, and reported claims will be examined.

Triangles - Reported claims

Accident Year	Development Year			
	1	2	3	4
2007	100	140	145	145
2008	90	100	105	
2009	145	220		
2010	120			

Portfolio assumptions:

- Consistent claim processing
- Claims' types stable mix
- Stable policy limits

Accident Year	Development Year		
	1-2	2-3	3-4
2007	1.40	1.04	1.00
2008	1.11	1.05	
2009	1.52		

Development Year		
1-2	2-3	3-4
1.37	1.04	1.00

Age to age factors

Loss development factors

Reserving Methods - Chain Ladder

Development Year		
1-2	2-3	3-4
1.37	1.04	1.00

Accident Year	Development Year			
	1	2	3	4
2007	100	140	145	145
2008	90	100	105	105
2009	145	220	229	229
2010	120	165	172	172

Ultimate Loss	IBNR
145	**145-145 =** 0
105	**105-105 =** 0
229	**229-220 =** 9
172	**172-120 =** 52

Reserving Methods – Chain Ladder

Reserving with the Chain-Ladder technique:

+ Pros +

- Takes into account actual claims experience
- No other assumptions needed

- Cons -

- Purely multiplicative method
- Large volume of historical claims experience needed
- Very sensitive to substantial variations (large losses)
- Insurers to stay in a stable environment (constant speed in claims closure and payment)

Other Reserving Methods

- **Expected claims technique**
  - Need an *a priori* expectation regarding the loss ratio
  - Expected Loss = Premium x a priori LR
- **Bornhuetter-Ferguson**
  - combination of the Chain Ladder and the expected claims technique
- **Other methods**
  - Benktander
  - Cape code

Which projection method should be used?

- Each method has advantages and disadvantages
- There is no method that will deliver the “correct” estimate of ultimate losses in an automatic fashion
- The most critical issues associated with all the methods being the relevance of historical reporting and/or paid patterns to the period of interest
- A thorough understanding of the characteristics of the portfolio underlying the reported claims is critical and increases the confidence in the results produced by the projection methods.
- Engineering specific: In the case of project business (CAR/EAR) the risk exposure needs to be measured and understood, as this is the base of the claims experience over the period.

Engineering specific characteristic

Renewable business

- underlying exposure remains approximately uniform throughout the policy period as value at risk and operational matters stay constant (Property)

reserving techniques like Chain Ladder are suitable

Project business

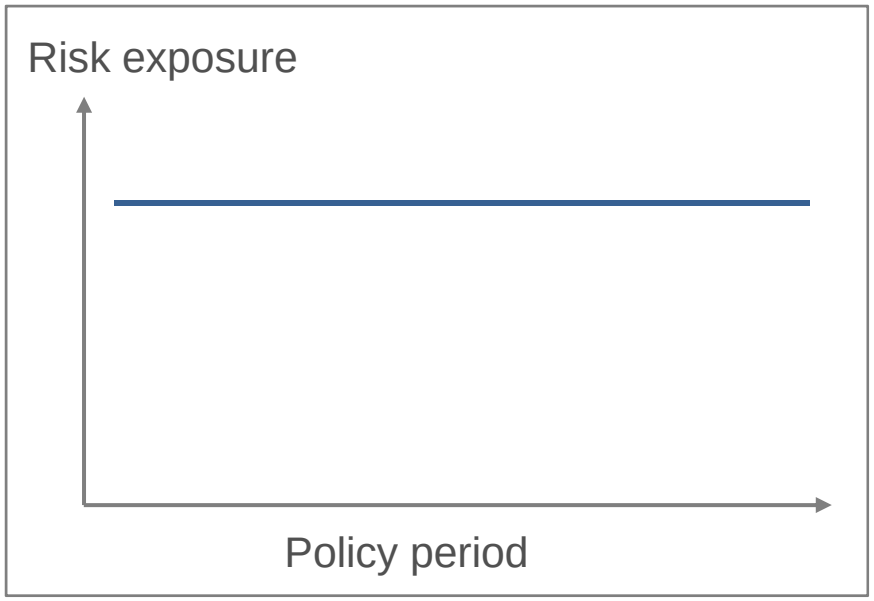
- underlying exposure increases over the multi year policy period as value at risk and covers are not constant

Changing exposure should be considered in age-to-age factors with some direct relation to the premium earning pattern used for the specific class of business

Improving the reliability of Engineering lines reserves needs a separate analysis of renewable and project accounts according to their exposure over the period.

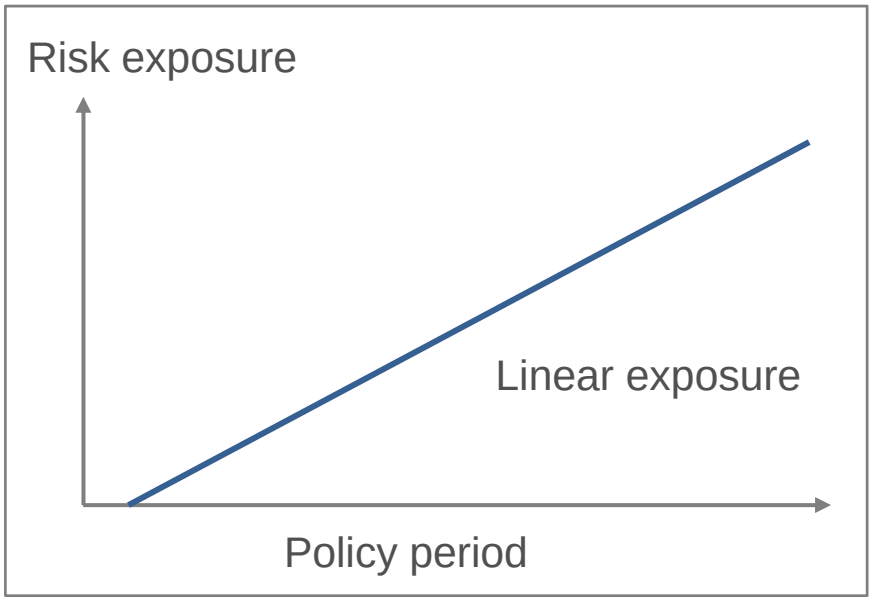
What is an appropriate earning curve?

Fixed exposure (MB, EEI, Property)



=> a pro-rata temporis (proportional) earning curve is appropriate

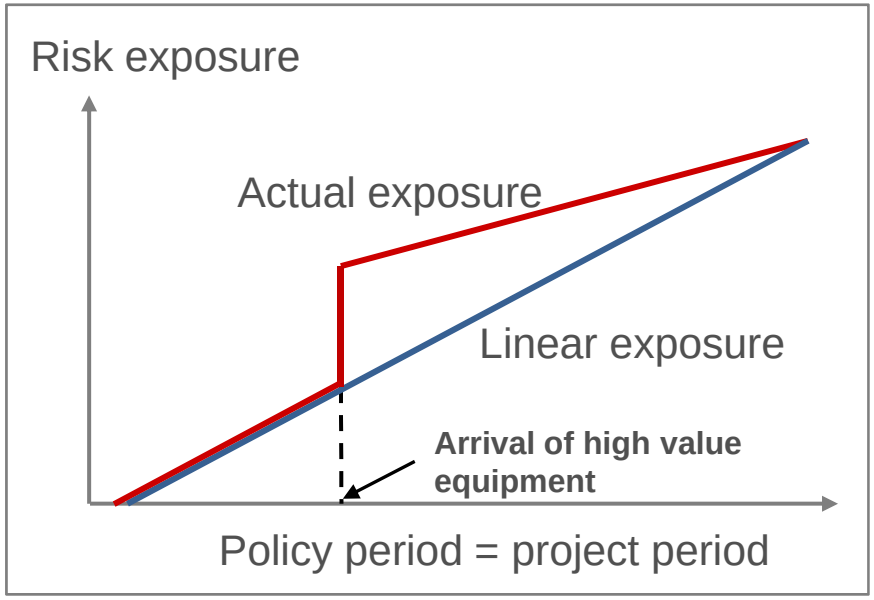
Exposure increasing (CAR/EAR)



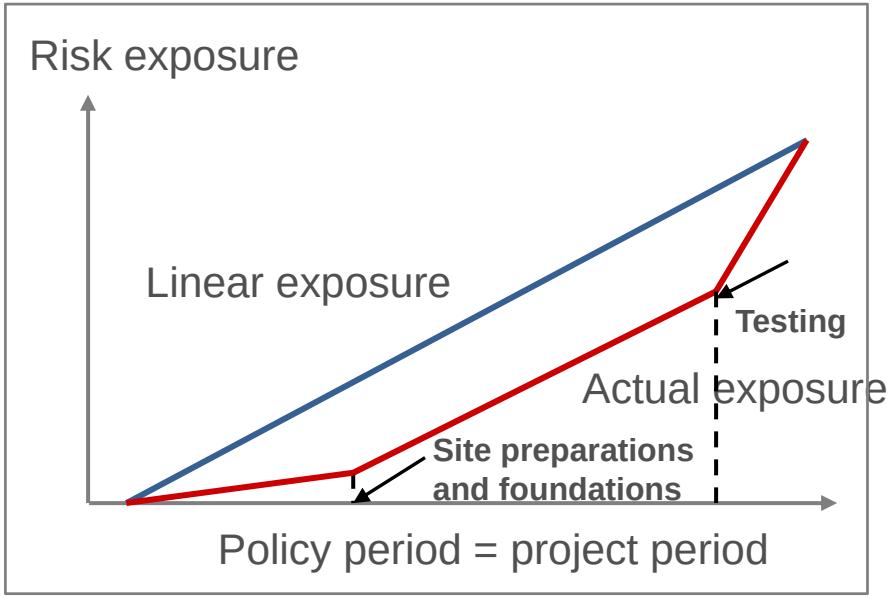
=> a pro-rata temporis (proportional) earning curve is not appropriate

What is an appropriate earning curve?

Exposure increasing (value at risk)



Exposure increasing (policy cover)



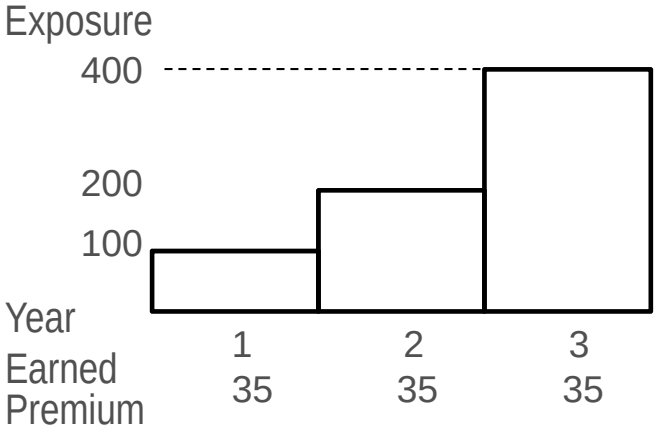
From the exposure to an earning pattern

Illustration:

- 3 years construction policy
- exposure during the 1st year is 100, 200 in the 2nd and 400 in the 3rd
- premium generated: 105

What is an appropriate earning pattern?

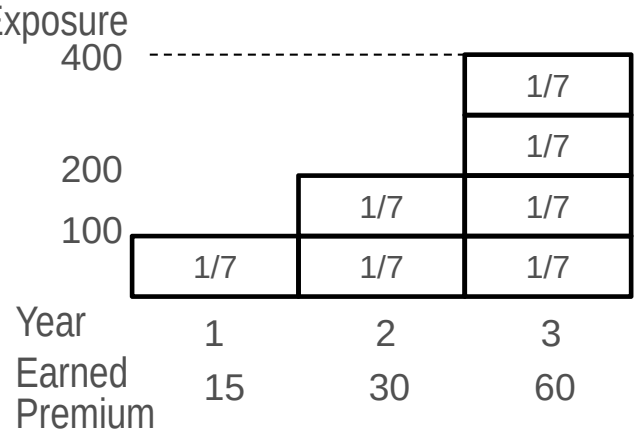
Case 1: pro rata temporis earning



The time to earn the premium considered but not the fact that the exposure is increasing year by year

=> NOT SATISFACTORY

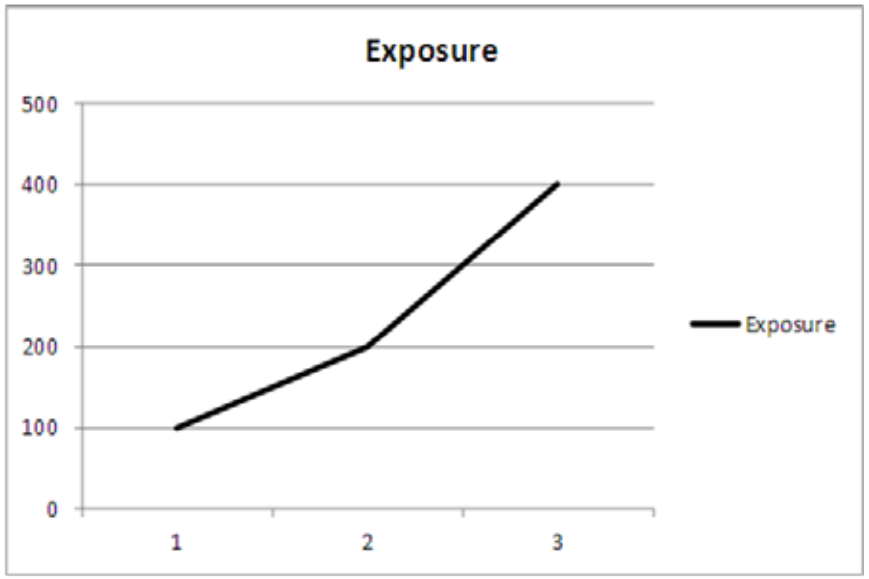
Case 2: earning according to exposure by year

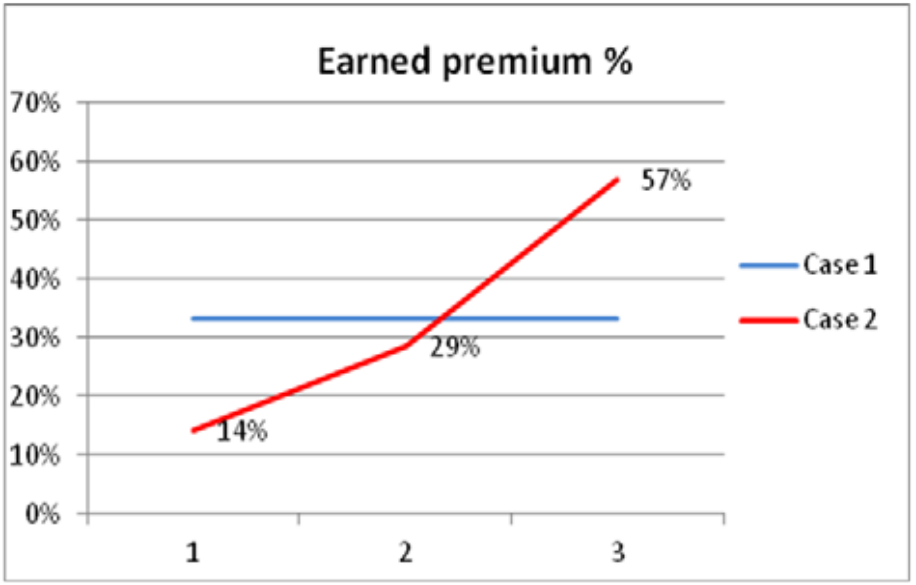


Time and exposure evolution considered

=> MORE APPROPRIATE ?

From the exposure to an earning pattern





From the exposure to an earning pattern

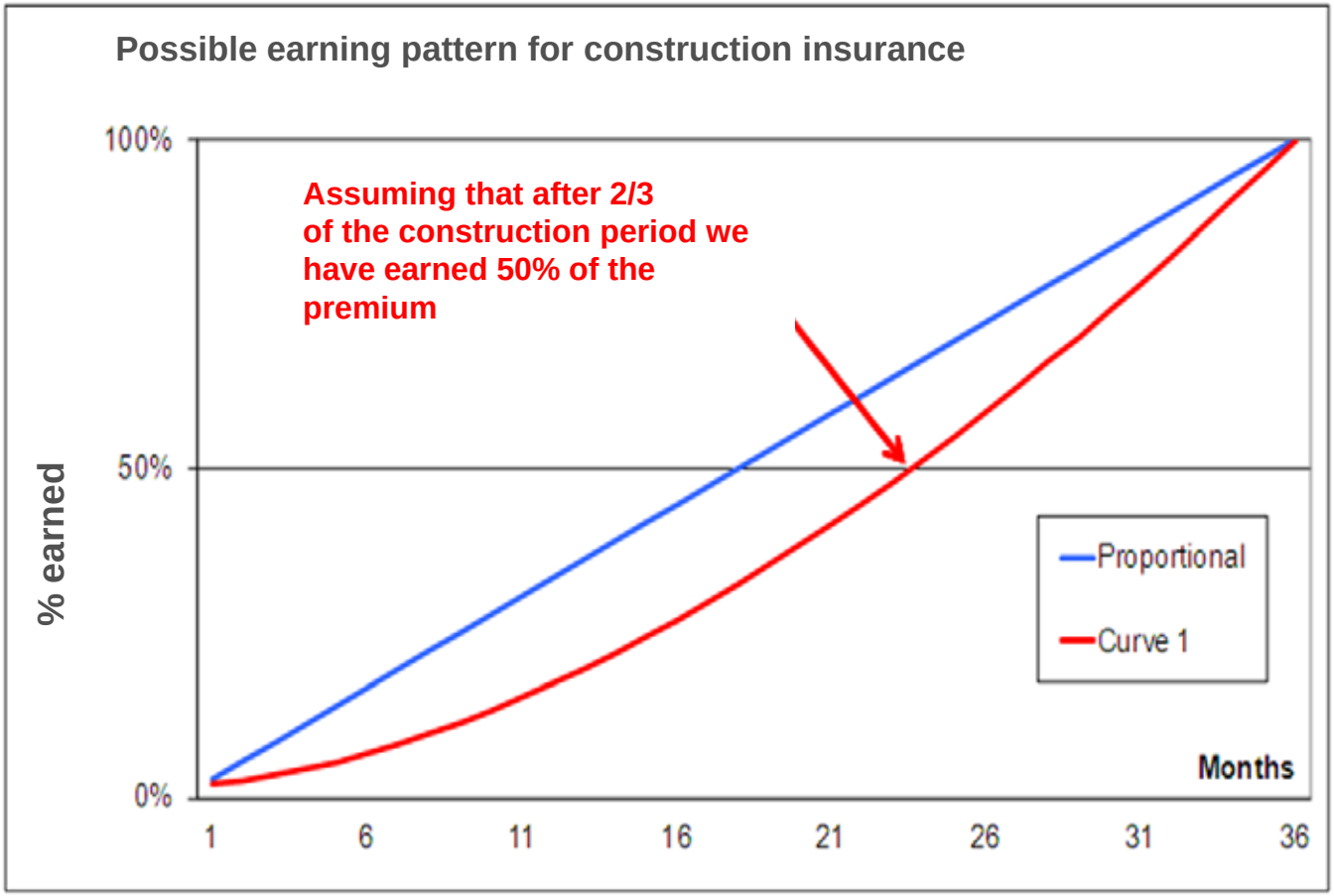
The calculation of “non-pro rata” earning patterns depends highly on the evolution of the exposure => we need the evolution of the exposure at any point of time during a project:

- Project bars chart giving milestones?
- Project status monitoring surveys?

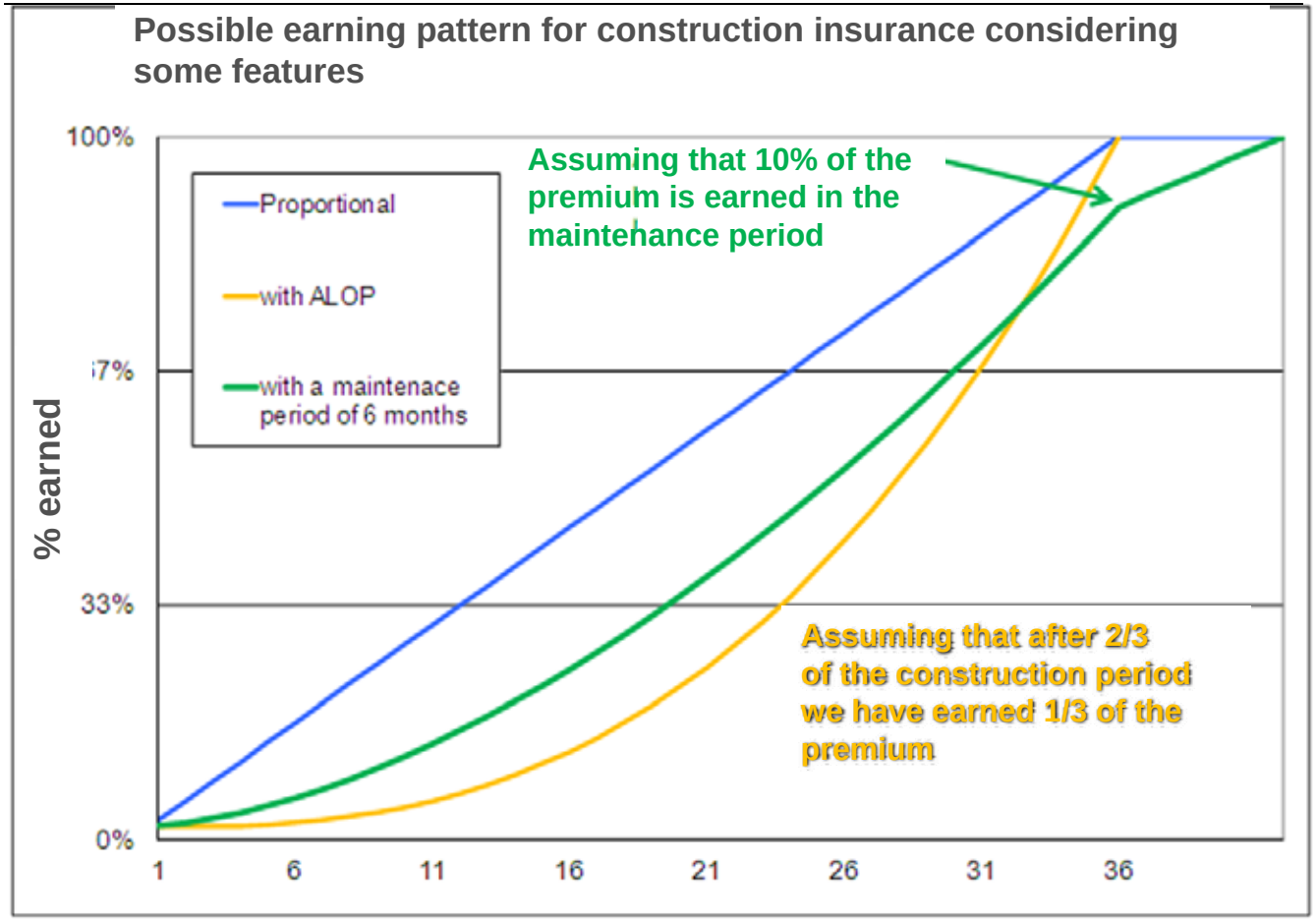
These ways have their constraints and limits

=> make some assumptions directly on the earning pattern

Assumptions directly on the earning pattern



More characteristics to consider?



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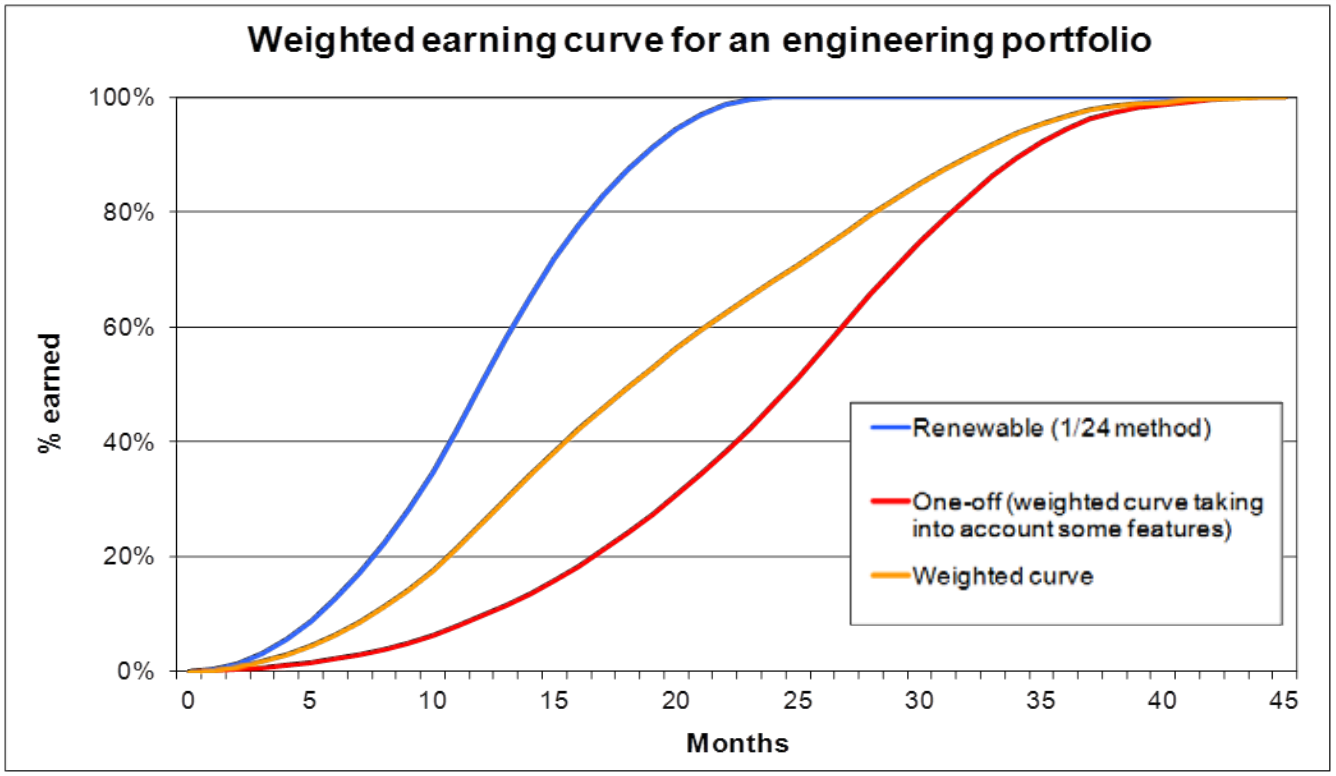
Application to a master policy / reinsurance treaty



Build a combined curve with the following assumptions:

- % of the portfolio which is made out of renewable business
- % of the portfolio made out of project/construction policies:
  - average duration of the construction period of the underlying policies
  - average duration of the maintenance period of the underlying policies
  - % of the underlying policies have an ALOP cover

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Conclusion

- **Claims reserves** for losses not yet paid can significantly impact insurance and reinsurance companies' **balance sheet** and **profit & loss** account.
- Insurers currently use **several methods to determine reserves.**
  A combination of different techniques are used to come to a **sound opinion** on the amount and adequacy of reserves needed.
- A thorough understanding of **underlying portfolio characteristics** in relation to reported claims is critical especially for **construction business** with exposure pattern varying over a multi-year period.
- **Reliability** of claims development projections and estimates mostly **depends on data volume and accuracy**.
  Data made available to actuaries should be extracted from IT systems **designed to capture key information** preventively agreed with experienced underwriting functions.

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