



# AWAKENING DATA SCIENCE IN CLAIMS RESERVING

Dr. Marco Beria, Pierluigi Cerqueti  
GDSD, Munich, 18<sup>th</sup> February 2020



**A first consideration:**

**Insurance business is a lot about data and analytics**

**...indeed...**

**it is a lot about 'predicting the future'**

**'predicting the future' is a lot about analytics...**

**...it is a lot about data science**



**Data science is a lot about:**

**“mining” data**

**modeling & exploration**

**Understanding & explaining results**

**‘scripting’ & coding**





**Actuaries are a lot about:**

**pricing**

**reporting**

**risk management**

**reserving**





**Very similar skills and mindset...**

**...sometimes different tools...**

**...sometimes different methods...**

**... sometimes different language...**

**...often different approaches...**

**Gradual awakening of data science in claims reserving**

# Different approaches and 'philosophies'



# THE ACTUARIAL CLAIMS RESERVING

A high level overview



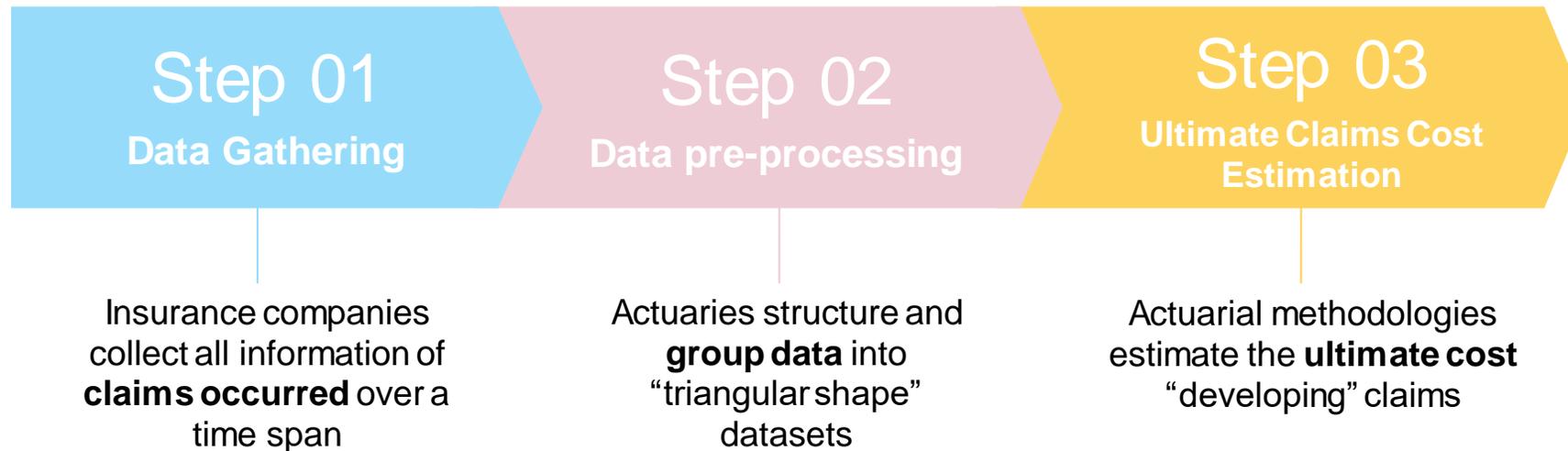


# THE TRADITIONAL CLAIM RESERVING PROCESS

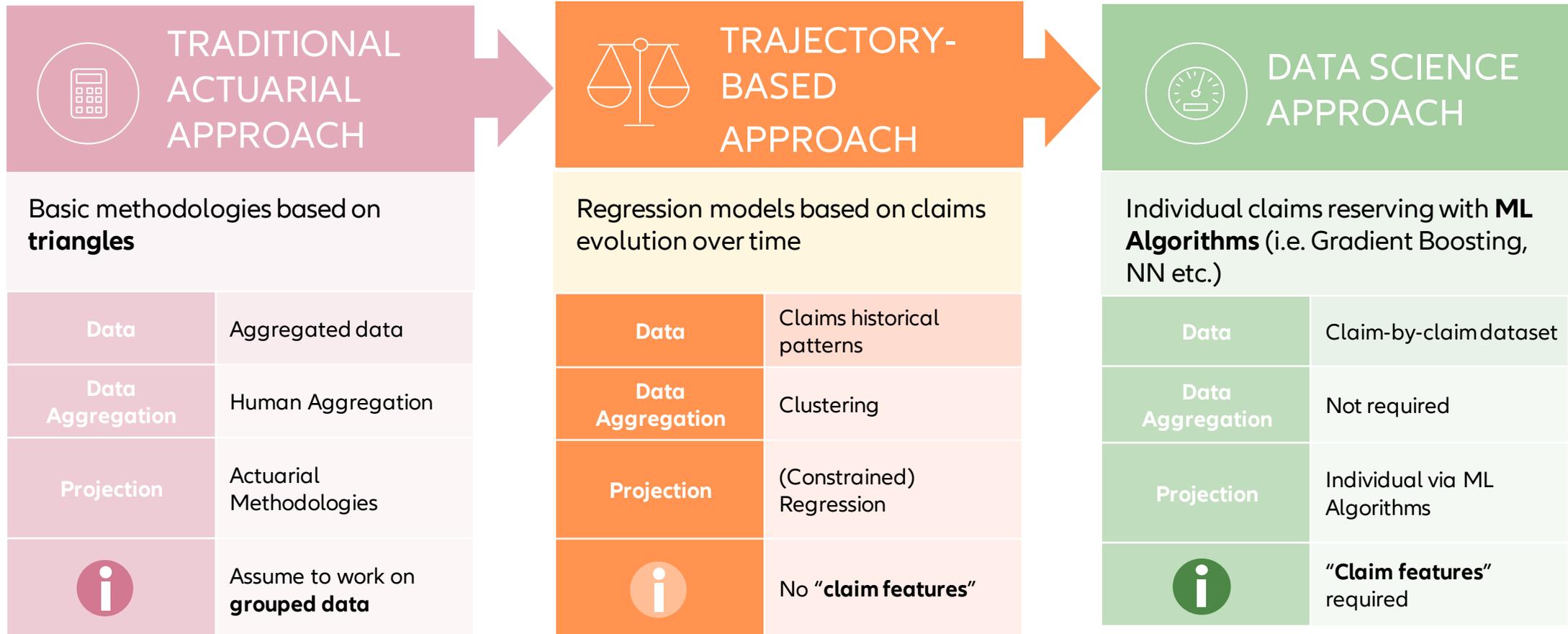


## Claims Reserving:

Estimate and forecast the **outcome** for each potential claim (**Ultimate Claim Cost**) in the future to ensure that the company has enough **reserves** to fulfill liabilities



# BRIDGING ACTUARIAL AND DATA SCIENCE WORLD



# THE TRAJECTORY-BASED APPROACH

**Gradual** introduction of machine learning techniques into traditional claim reserving process

References:

ASTIN Colloquium 2019

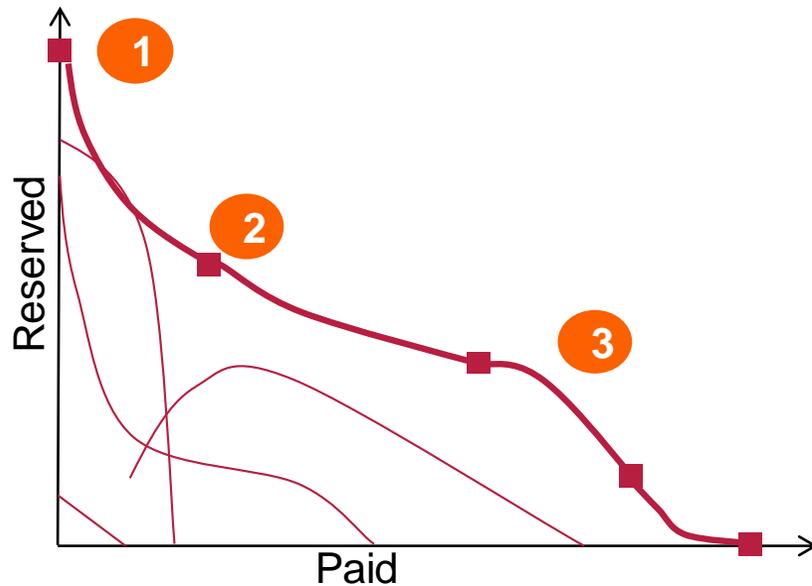
Carrato, Visintin

*"From the Chain Ladder to Individual Claims Reserving using Machine Learning Techniques"*

<http://bit.ly/2VzoNwg>



# THE PAID-RESERVED TRAJECTORY



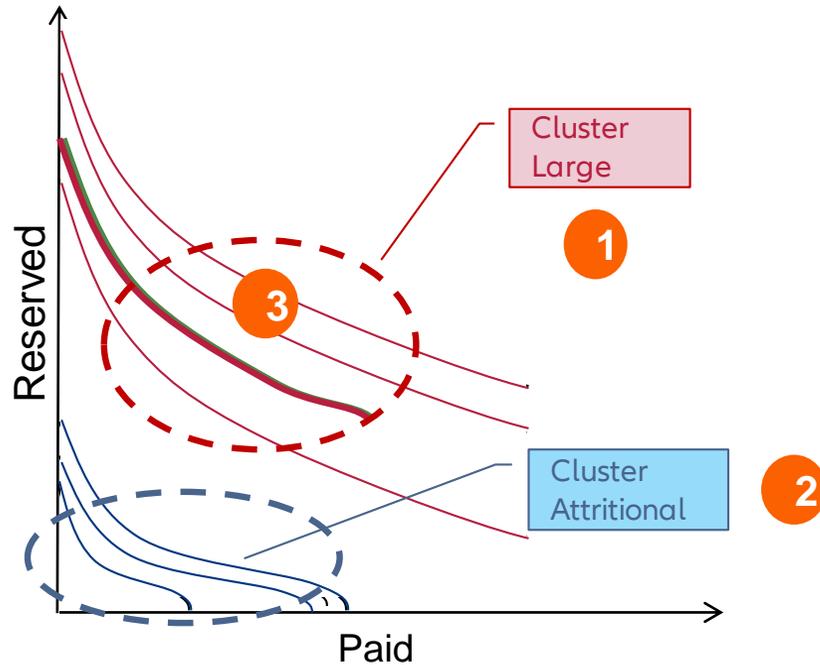
1. After its occurrence, a claim is reported and a case reserve is allocated

2. Subsequently, a certain amount is paid and the case reserve decreases accordingly

3. The claim continues its developing until is definitively closed (Ultimate Cost)

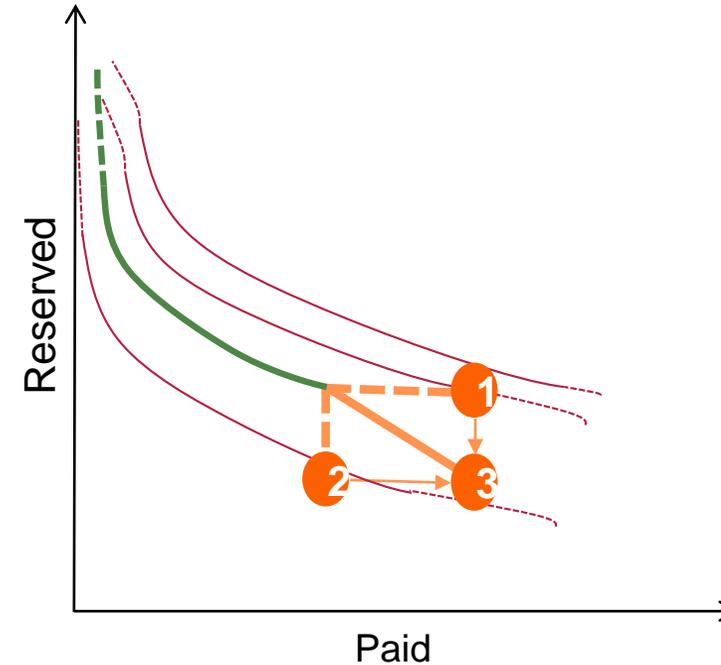
# THE TWO-STEPS ALGORITHM

## Step 1 – Clustering



> With clustering techniques, we are able to identify and aggregate claims with similar trajectories up to a fixed development period

## Step 2 – Developing



> Two linear regression model, are fit on historical claims data to develop the paid amount (1) and the reserved amounts (2). Therefore, the projected point has coordinates defined by (1) and (2)

# THE DATA SCIENCE APPROACH

Individual claims reserving with **ML Algorithms** (i.e. Gradient Boosting, NN etc.)

References:

Casualty Actuarial Society Working Paper (2020)

Cerqueti, De Virgilis

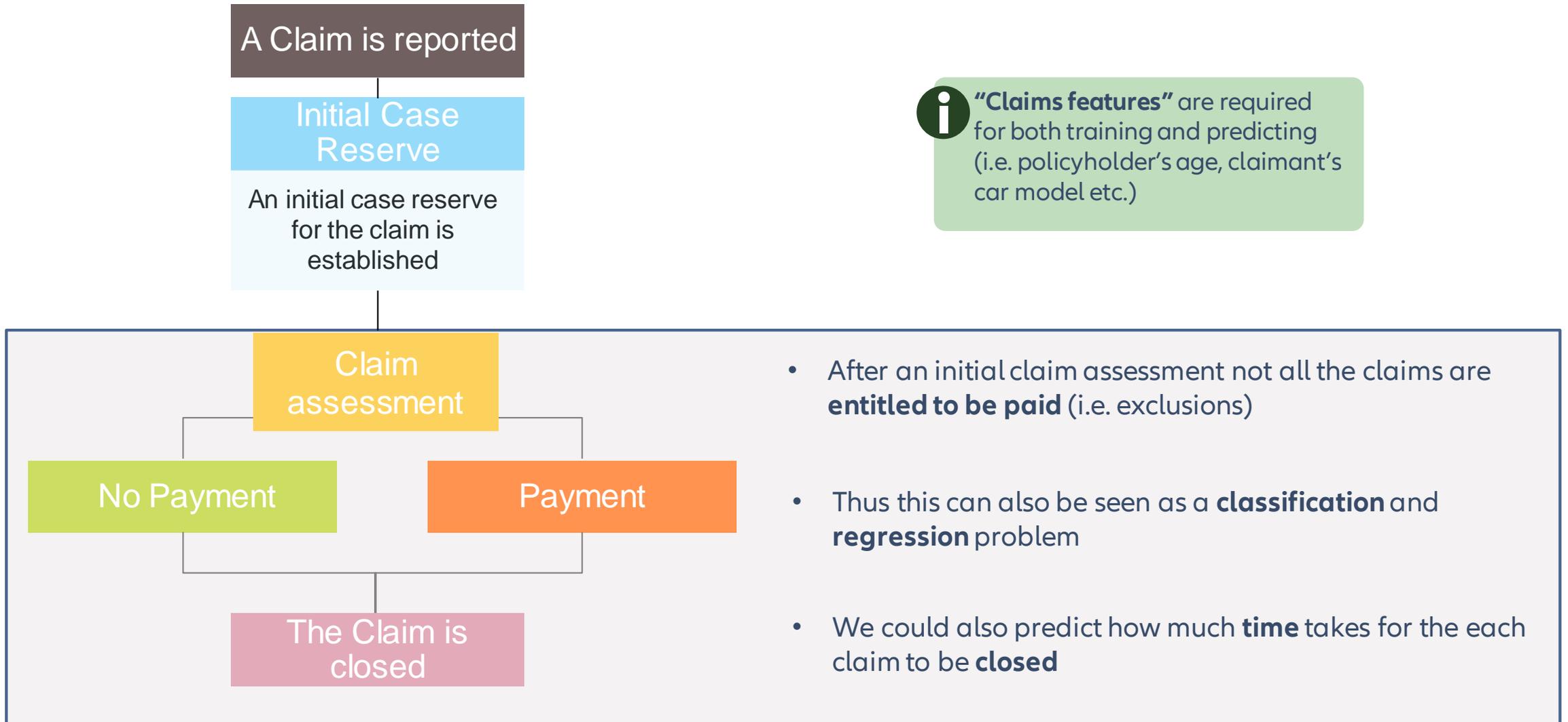
*"Estimation of Individual Claim Liabilities – A comparison of Traditional and ML Methodologies"*

<http://www.casact.org/research/wp/papers/working-paper-Virgilis-Cerqueti-2020-01.pdf>

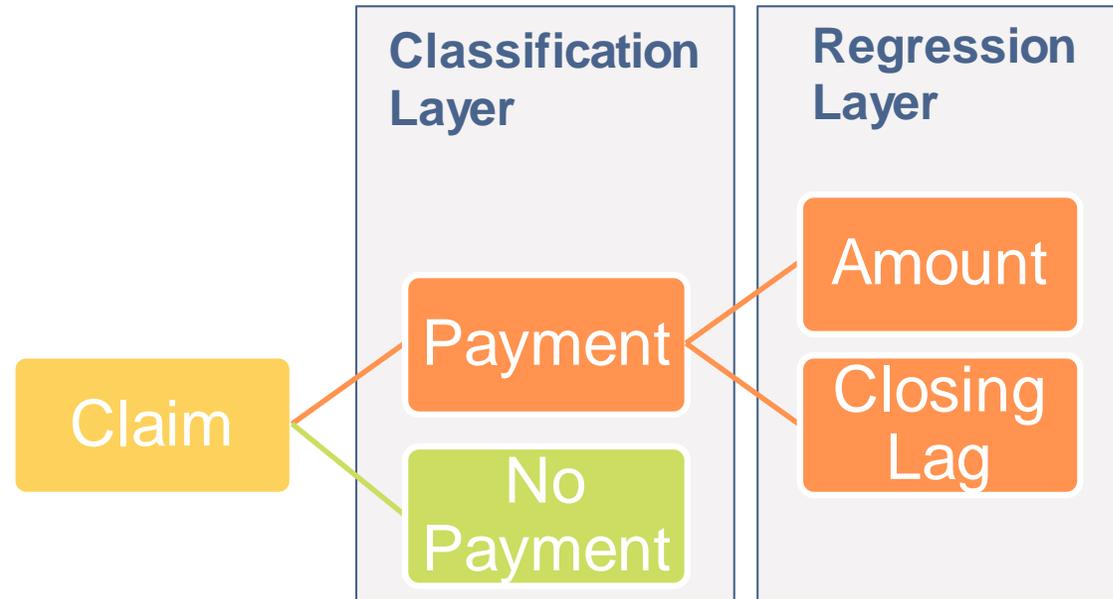




# A NEW PARADIGM FOR INDIVIDUAL CLAIM RESERVING



# MODELLING FRAMEWORK



1. First the a ML algorithm **classifies** whether a claim might be closed with **no payment**
2. If this first process will have a **negative outcome** (i.e. the claim will be paid), an **amount** will be calculated (**Ultimates**)
3. A third model will estimate the time that this process will take, from the moment the **claim is reported until it is closed (Closing lag)**
4. The **overall reserve** is then calculated by summing-up all the non-nil predicted amounts



**The introduction of new approaches**

**respecting and gradually enhancing existing methodologies**

**'fertilizes' the awakening of the data science in claims reserving**



# Disclaimer

These assessments are, as always, subject to the disclaimer provided below.

## Forward-looking statements

The statements contained herein may include prospects, statements of future expectations and other forward-looking statements that are based on management's current views and assumptions and involve known and unknown risks and uncertainties. Actual results, performance or events may differ materially from those expressed or implied in such forward-looking statements.

Such deviations may arise due to, without limitation, (i) changes of the general economic conditions and competitive situation, particularly in the Allianz Group's core business and core markets, (ii) performance of financial markets (particularly market volatility, liquidity and credit events), (iii) frequency and severity of insured loss events, including from natural catastrophes, and the development of loss expenses, (iv) mortality and morbidity levels and trends, (v) persistency levels, (vi) particularly in the banking business, the

extent of credit defaults, (vii) interest rate levels, (viii) currency exchange rates including the EUR/USD exchange rate, (ix) changes in laws and regulations, including tax regulations, (x) the impact of acquisitions, including related integration issues, and reorganization measures, and (xi) general competitive factors, in each case on a local, regional, national and/or global basis. Many of these factors may be more likely to occur, or more pronounced, as a result of terrorist activities and their consequences.

## No duty to update

The company assumes no obligation to update any information or forward-looking statement contained herein, save for any information required to be disclosed by law.