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Profitable Growth in Insurance Driven by Time-on-Book

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Abstract

This research note introduces a self-predictive model for estimating the profitability of a Property&Casualty (P&C) motor insurance business over time, depending on the choices made by management. The most commonly used key performance indicator (KPI) for a P&C insurance company's balance sheet, i.e. the Combined Ratio in the actual year (CoR), inaccurately evaluates growth quality and masks its critical drivers.

Financial analysts and top management in the P&C insurance industry often weigh the tradeoff between growth and profitability. The central question is whether growth is profitable and, if so, under what circumstances it becomes unprofitable. Achieving the optimal tradeoff requires objective analysis, reliable business plans, clear expectations, open communication, and precise control. The simplified model proposed in this article helps to clarify and decide between different alternatives.

Introduction

The trade-off between growth and profitability does not typically have a significant impact on well-established P&C insurance companies or larger corporations, where growth minimally impacts results because of the size of the existing portfolio. However, pursuing an aggressive growth strategy can be a critical and potentially devastating problem for medium-sized companies. This issue is even more significant for startups, insurtechs, and small direct companies looking for rapid expansion through direct web distribution and partnerships with comparison sites. For instance, *prima.it* rapidly grew to become the largest direct motor operation in Italy with over 2.5 million customers in less than 10 years, but to achieve such a result, suffered significant losses for many years.

Successful business in this industry typically experience steady growth for multiple years. However, financing growth may lead to negative accounting profits, requiring shareholders to fund balance sheet losses with the company's own seasoned portfolio to generate profits, ultimately resulting in reduced dividends for shareholders. The sustainability of growth and a reliable projection of the break-even point therefore are pivotal matters.

The key questions to consider are:

- How can a company manage growth in a competitive market with cyclical trends?
- What is the maximum Combined Ratio (CoR) that will result in an increase in the total value of the business?
- How does this value change as a result of company expansion, and what is the highest growth rate that can be sustained within the shareholders' authorised investment limit?
- What are the various ways to utilize shareholder capital efficiently?
- Balancing growth while leveraging a single sales channel to protect or improve the business value of other channels is a challenging task due to variables that evolve over time and require frequent model adjustments. How can this be accomplished?

The author formulated this model based on his extensive experience as CEO of Genialloyd Spa, (part of Allianz Group) a thriving direct motor insurance company in Italy that achieved 100 consecutive months of profitable growth in a declining market. From 2009 to 2018, the company tripled its *Gross Written Premiums* (GWP) and rose from 23rd to 7th place in the Italian Motor Third Party Liability (MTPL) business. The model is based on assumptions which can be further sophisticated in successive research works.

1. Profitability improves over time

Time-on-book is critical to understanding the profitability of a portfolio: seasoned motor portfolios are observed to be much more profitable than new business. Any insurance portfolio is a mix of policies of different maturities, i.e. underwritten at different times and according to different Pricing & Underwriting (P&U) rules.

The contrast between cohort and period perspectives is well-known in demography and statistics. A cohort of insurance policies is a group of policies that were issued in the same year or during a similar time period. Cohort analysis is a powerful tool used by insurers to improve their profitability and make better decisions about P&U. Quite the opposite, the balance sheet representation in insurance companies is a clear example of the period perspective, where the result is determined by all policies in the portfolio, regardless of the year in which they were introduced, i.e. the cohort to which they belong.

This article focuses on the cohort perspective, which studies the behavior of policies originating in the same year. This perspective proves very valuable in highlighting certain growth aspects; moreover IFRS 17, the new accounting standard for insurance contracts in force in Europe from January 1 2023, requires insurers to use annual cohorts to report their financial performance: this requirement is designed to improve the transparency and comparability of financial statements for insurance companies.

In the competitive market of Motor insurance within a mature European market, sound insurance companies underwrite new business with a *Predicted Combined Ratio* (PCR) often exceeding 100%, occasionally reaching even 115-120%. This means that in the first year, new business incurs a loss rather than a profit on the company's balance sheet. The PCR is one of the most widespread actuarial methods to foresee the ultimate result of an insurance business.

The rationale behind this seemingly paradoxical decision is clear: competition requires lower prices to attract new customers, thus welcome discounts must be used profusely to reduce the appropriate actuarial prices. However, in most markets the P&C portfolio's stickiness in the retail risk business enables companies to retain and renew a significant portion of the portfolio profitably, with a much better combined ratio from the second year onward. The improvement in combined ratio is due to various factors affecting the bad driver segment, including:

- the disappearance of possible moral hazard after just one year, i.e. at the first renewal; it's well known that fraudulent activity has a significant impact on the first time period because fraudsters very seldom renew their contracts
- the enhanced awareness of risks, which enables the company to provide more precise pricing at the time of renewal, eliminating bad risks. Generally, bad drivers who file a claim in the first year are offered a significantly higher renewal price, which often leads to them leaving the portfolio.

All of these effects are referred to by the insiders as *skimming off the cream*, the typical work that companies do all the time. However, better results can be achieved starting from the second year by implementing other common practices in the good driver portfolio segment, such as

- the change in the mix of high-frequency/low-frequency switching customers, due to different lapse behavior
- recovering new business discounts through higher renewal tariffs with increased technical margins; this may be mitigated by a suitable price cap, if local legislation allows it: In the UK, for example, this practice is banned
- offer other profitable coverages such as legal protection, personal accident and roadside assistance in addition to MTPL
- upgrading the insured limit to maintain at the same level the average premium, thus counteracting the natural decline of insurance premiums due to bonus/malus class evolution in MTPL, as well as the decrease in the insured value of MOD (Motor Own Damage) resulting from the aging of the vehicle.

Additionally, expenses emerge well before margins, which is usually referred to as *new business strain*. At the time of acquisition, new business incurs higher costs due to one-off costs and higher sales commissions. This is especially true for both agent networks and comparison websites. After the initial year, renewal fees are substantially reduced.

As a result of all these factors, it is easy to achieve a decrease from 10% to 20% in the CoR immediately after the first renewal. This decrease is not due to any difference in behavior of the drivers who renewed their policies, but is mainly attributed to a significant improvement in the mix between good and bad policies. This improvement continues in the following years, though to a lesser extent, until reaching a horizontal asymptote.

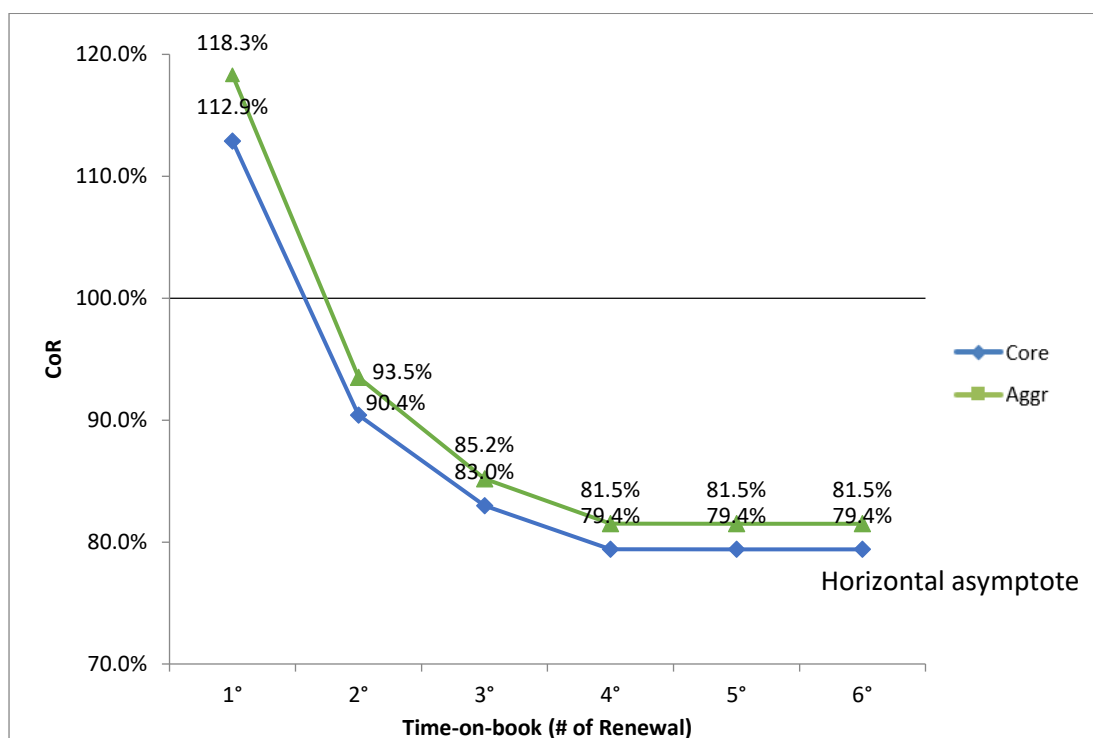
Insurance companies often use multiple sales channels, with different characteristics and behaviors. The CoR evolution over time is quite similar: however, each sales channel has unique metrics, and intrinsic business value is normally lower for intermediated channels because of the commissions paid.

In this paper, most of the numbers showed in the examples come from a real case of a P&C company operating in Italy in 2010-2020 in Retail Motor insurance business. This Company invested significantly in knowledge and showed significant success both in growth and in technical results. This Company used two different distribution channels, direct core business on the web and comparison websites (henceforth referred to as 'aggregators', abbreviated 'Aggr.'" in the figures).

In Fig. 1 CoR of a single cohort of policies is plotted against time-on-book (i.e. number of renewals). New business is not profitable in the first year, with CoR at 118.3% for aggregators and 112.9% for direct business.

Nevertheless, from the second year onward, surviving business become profitable for both channels, the patterns displayed over years are similar and the discrepancy between the channels progressively decreases. The ultimate CoR reaches a horizontal asymptote of 82,5% for aggregators and 79,4% for direct business in mature cohorts.

Fig. 1 - CoR varies according to time-on-book for different distribution channels.



2. Furthermore, retention improves over time

Not only CoR, but furthermore policy retention improves as a function of time-on-book. First renewal is the most critical because of different factors:

- bad risks are normally expelled as a result of portfolio cleaning actions
- good risks usually get a price increase to make up for discounts offered in the first year to new customers, while competitors offer aggressive welcome discounts
- customers are not yet loyal.

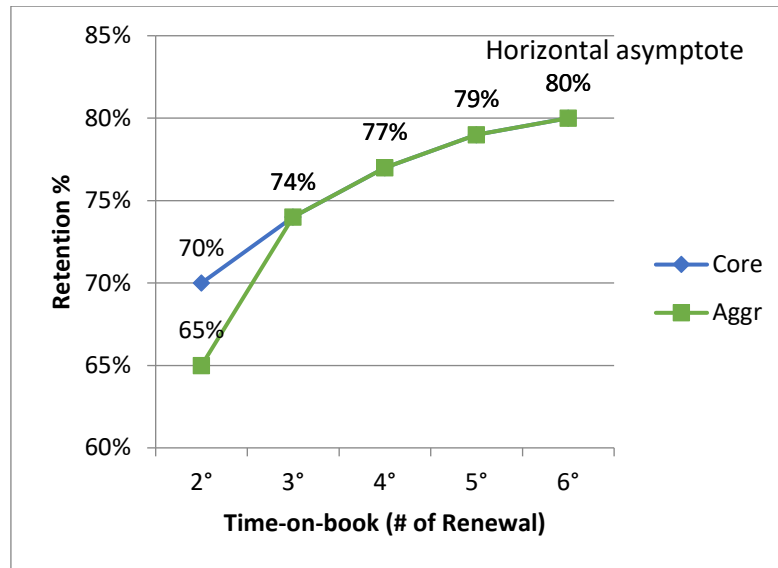
After a few years a horizontal asymptote is reached in the range of 75% to 90%, depending on the market, sales channel and quality of company operations. In Fig. 2 an ultimate retention of 80% is assumed. The main reason of the improved retention is both loyalty of the customers and the changing mix of the portfolio over time.

The rate of retention also varies according to the sales channel. This discrepancy is particularly evident at the first renewal, due to:

- the lack of brand loyalty among price-seeking customers
- the competitive offers presented by comparison websites to customers.

In subsequent renewals, the retention rates for different sales channels tend to converge.

Fig. 2 – Policy retention varies according to time-on-book for different distribution channels.



3. Switching behavior is the trigger

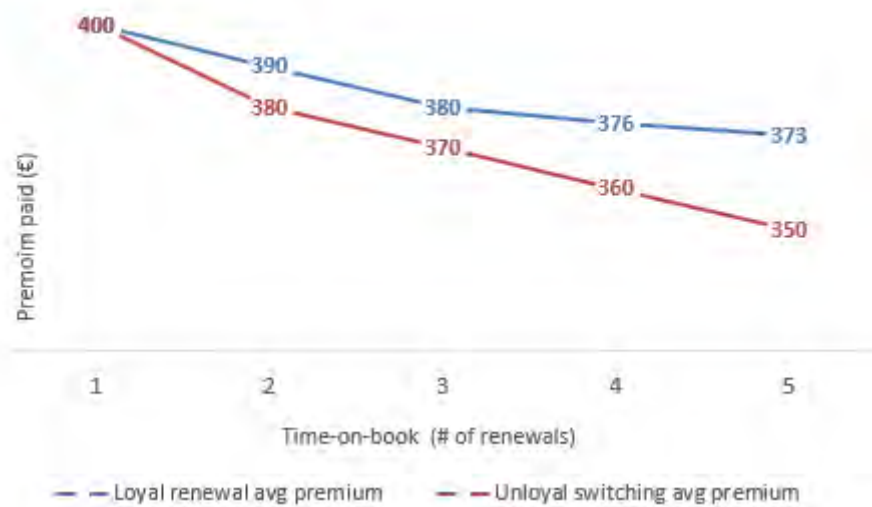
This section addresses a crucial paradox.

Why does a policy that has been profitable for years in Company "A" book become immediately unprofitable when switched to Company "B" book? The underlying risk remains consistent, and the driver's behavior does not change simply because of a switch. Two potential explanations are as follows:

- Company "A" actuaries have implemented effective renewal strategies over time, including repricing risk and upselling. Consequently, loyal customers have accepted incremental premium increases annually, resulting in higher margins for company "A"
- The primary motivation for switching customers is to obtain lower prices when moving to Company "B", typically to take advantage of welcome discounts. Repeated switching behavior can potentially lead to margin erosion, which could ultimately result in an unprofitable policy at a lower price, regardless of which company is underwriting the risk.

It is therefore crucial for a company to strike a balance between these two conflicting needs: increasing the premium to recover the initial welcome bonus and keeping the premium low to discourage switching. This balance is different for loyal customers, who are likely to accept a small premium increase, and for unloyal customers, who are more likely to check out better deals on the market. The average premium paid will therefore vary depending on whether customers are loyal or unloyal at renewal. As a real-case, historical example, the typical premium evolution as a function of time-on-book is shown in Fig. 3. For consistency, throughout this article the term *premium* refers to the total amount paid by the customer after tax.

Fig. 3. Average premium paid as a function of renewals for loyal and unloyal customers.



4. A model for cohort profitability

At this point, it has been demonstrated that time-on-book has a significant impact on the profitability of the insurance business.

- both obtaining a better CoR
- and getting a higher renewal rate.

If average time-on-book of a portfolio is a useful parameter to describe a stationary-sized company, unfortunately the average time-on-book is the wrong parameter to describe a growing portfolio, because it is hiding some fundamental trends. In order to fully understand them, investigations must be carried out by *cohort*, as the underwriting profitability can significantly change over time, due to internal pricing and underwriting changes, external competition, company appetite for growth and still further factors. Even within a single cohort the average is not perfectly describing the behavior, as pricing and underwriting rules are frequently changing during the year (even on a weekly basis for the best companies) and even at the same time can be very different for different risk clusters.

In this article only CoR of the actual year is considered, by means of a thorough use of the *Predicted Combined Ratio*. The effect of reserve runoff, which might result in an implicit important profit or loss, depending on the reserving habits of a company, will not be taken into account, under the assumption that reserves are substantially correct. In the real case we are taking numbers from, a positive reserve runoff of several percentage points (2% to 7% depending on the year) was experienced, thus contributing in a significative way to the profitability of the company. Also cost of capital due to Solvency II issues is here disregarded, as well as financial profits. In the following *profit* always refers to *operating profit*.

In order to set up the model, many parameters are required, which can be derived based on previous observed behavior. For startups or new operations, parameters must be guessed from assumptions, also with comparisons with peers, competitors and market practice. Large reinsurance companies such as Munich Re and Swiss Re and large international consulting firms such as PricewaterhouseCoopers, Deloitte and Ernst&Young can provide these parameters for a given market.

If the company operates different sales channels with different behavior, the set of input parameters to be provided must be separated by sales channel. In any case, a sound knowledge of the company's cost structure is required, with a breakdown of fixed and variable costs, actual and forecast for future years, taking into account the evolution of the business, and economies of scale. In addition, other models are required, observed or assumed:

- an evolution of the renewal rate from year to year
- an average premium trend over time, both for new business and for renewals
- the assumed growth path.

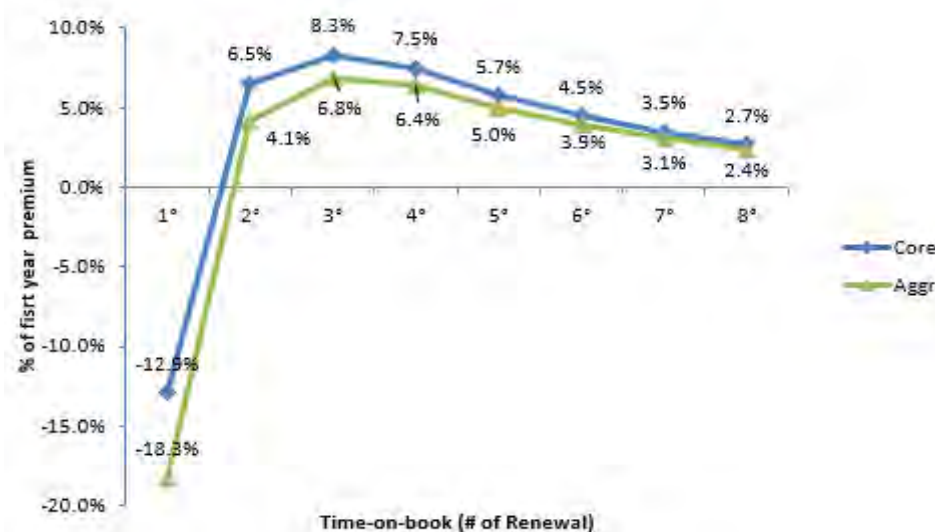
5. Profit/Loss by year

For a given cohort, the predicted profit/loss as a function of the time on book is worse in the first year and improves from the second on a lower number of policies. The best way to visualize the combination of decreasing CoR and increasing renewal rate is to plot the ratio between the profit or loss of a single cohort to the first year GWP.

The combination of decreasing CoR and increasing renewal rate on a shrinking portfolio over time results in a very typical curve, which strongly depends on input parameters, shows in the real case, historical example a peak at third year (8,3% on core business and 6,3% on aggregators, with respect to first year GWP), before reducing, due to shrinking portfolio effect and average premium reduction due to the bonus/malus sliding scale.

As an example, in this figure profit for core business is achieved on 6th year as 4,5% of first year GWP. The profit of this cohort evaluated on 6th year GWP is certainly much more than that, about 35%, but the size of the GWP surviving after 5 renewals is much less than the original size. Thus 4,5% results from dividing the profit generated by this cohort at 6th year by the GWP size *at the start* of the cohort. In this way, the yearly contributions can be correctly compared year by year and added up.

Fig. 4. Yearly predicted profit/loss as a function of time on book, in percentage of first year GWP.



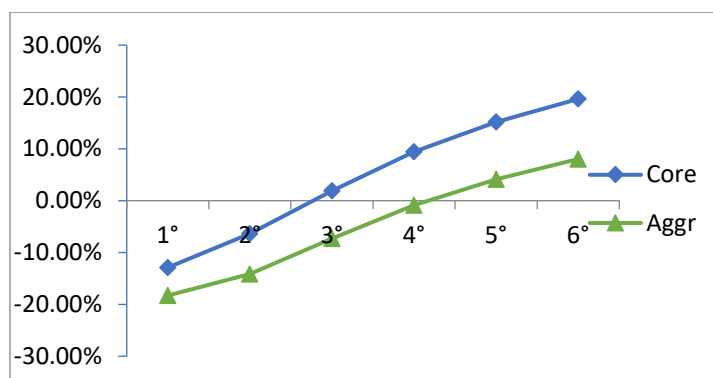
Depending on parameters, negative results might appear not only for the first, but also for some following years. In a competitive market, where customer fidelity is substantial, the result for the first year *must be* negative: if it is positive, the company is not pursuing its growth path ambitiously enough and is giving up some of the growth potential that exists in the market, which will be captured by more aggressive competitors.

On the contrary, in some very competitive international Motor markets, where lapse ratio is very high, about 50%, it is necessary to reach breakeven much earlier, eventually on first year, thus CoR must be lower. The model is valuable in any case, but accurate knowledge of market behavior is required to run the model correctly.

6. Cumulated profit/loss result

For a given cohort, the cumulated profit/loss results by adding up each year contribution: the negative contribution of the first years and all the positive contributions of the following years. In the real case, historical example, breakeven is reached at third year for core business and at fourth year for aggregators. The ultimate profit of a given cohort in the example is 20% for core business, 8% for aggregators. This percentage is referred as usual to first year GWP.

Fig. 5. Cumulated profit/loss as a function of time on book, in percentage of first year GWP.

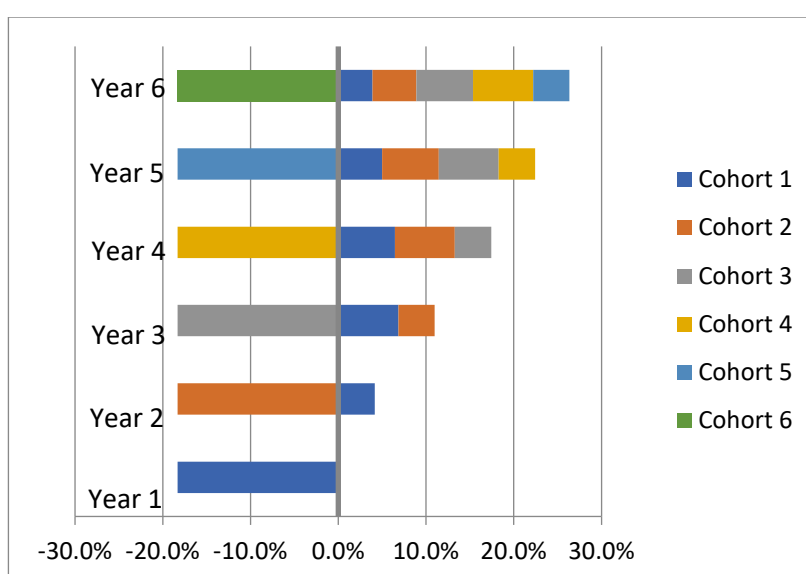


Depending on parameters, this cumulated profit might never breakeven and always remain below zero; this business must either be drastically corrected or stopped.

7. Time-on-book mix effects

The most interesting results arise when moving from a cohort view to an accounting view. In any calendar year many different cohort contributions add up to determine the result. Every year the new business cohort add a strong negative contribution, while the seasoned cohorts add slices of smaller positive contributions. In the above mentioned historical example, balance sheet breakeven is achieved in the third year for the core direct business and in the fourth year for aggregators.

Fig. 6. Profit/loss deriving from different cohorts in different years, as a percentage of first year GWP, assuming ALL new business cohorts have the same size.



8. Growth effect

It is to be expected that new business cohorts will not have the same size year on year. However, for successful operations, there is a tendency for volumes to grow, even significantly. Given the GWP growth forecast, the contribution of each cohort can be evaluated and added up to predict the yearly result. The steeper the growth, the longer the time to reach balance sheet breakeven: growth must be financed, including Solvency requirements which have been disregarded in this article and can lead to a refinement of the proposed model.

Life business has always experienced this behavior and always considers embedded value versus new business strain; this is completely unusual for P&C and especially for Motor business, because usually it is not fast growing, so does not need to take into account these considerations.

A thorough model can be developed using a simple spreadsheet in order to help companies to self-predict the profit behavior over time, including the cumulated losses before breakeven. Parameters required both for new business and for its evolution in the following renewals:

- Predicted loss ratio (PLR)
- Expenses (acquisition + administration) ratio, thus determining PCR
- Average retention

In the event that more than one sales channel is utilized, it is necessary to develop distinct models for each channel, given the considerable discrepancies in the associated parameters. Moreover, it is necessary to make assumptions about new business policy growth over time, selecting a growth scenario compatible with the ambitions of the company, e.g. steady linear growth, accelerated growth, stop-and-go, consolidation, etc. Growth cannot go on forever, so the target size of the business should also be considered.

From all these inputs it's easy to determine:

- the combined ratio as the sum of the loss ratio and the expense ratio
- the evolution of the number of the surviving policies of a cohort over time
- the profit or loss of an average policy and of a full cohort over time
- the cumulated profit or loss per calendar year, due to the contribution of all different cohorts

This simplified model is intended for the top management to understand the large scale influence of the main parameters and not to drive the actuarial business decisions, which have to be managed dynamically both for Pricing and for Underwriting at the level of single

policy (the so called *the segment of one*). This requires strong technical skills, appropriate software solutions such as those offered by PricewaterhouseCoopers, Oliver Wyman or Akur8, early monitoring systems and a learning-by-doing approach to address high-risk segments while preserving technical results.

To account for the contribution of the various cohorts, all parameters must be deconstructed into a triangular matrix. By feeding the model with different assumptions, it is simple to determine the impact of each cohort, i.e.:

- the CoR level threshold for which cumulated profit will never be positive (*unprofitable growth*)
- the number of years required to breakeven the business
- the amount of capital the shareholder needs to invest to reach breakeven
- the time to recover the invested capital and obtain a positive Return on Equity (ROE).

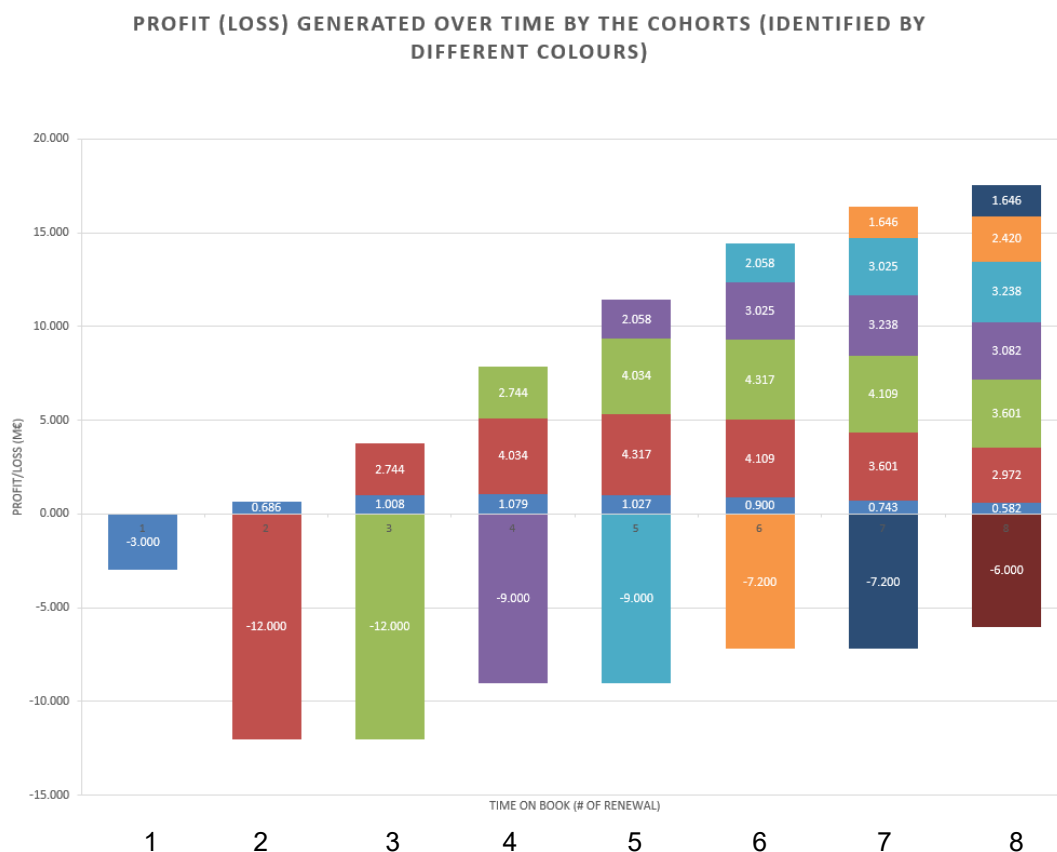
As an example, the model was run with the following assumptions, where the rows are different cohorts and the columns are the Time on Book (in years):

Fig. 7. Key simplified assumptions for the model.

AvgPremium(€)/Year	1	2	3	4	5	6	7	8
1	400	392	384	376	369	362	354	347
2		400	392	384	376	369	362	354
3			400	392	384	376	369	362
4				400	392	384	376	369
5					400	392	384	376
6						400	392	384
7							400	392
8								400
PLR/Year	1	2	3	4	5	6	7	8
1	95%	80%	75%	71%	68%	66%	65%	65%
2		95%	80%	75%	71%	68%	66%	65%
3			95%	80%	75%	71%	68%	66%
4				95%	80%	75%	71%	68%
5					95%	80%	75%	71%
6						95%	80%	75%
7							95%	80%
8								95%
Expenses Ratio/Year	1	2	3	4	5	6	7	8
1	20%	15%	15%	15%	15%	15%	15%	15%
2		20%	15%	15%	15%	15%	15%	15%
3			20%	15%	15%	15%	15%	15%
4				20%	15%	15%	15%	15%
5					20%	15%	15%	15%
6						20%	15%	15%
7							20%	15%
8								20%
Retention/Year	1	2	3	4	5	6	7	8
1	70%	75%	78%	80%	80%	80%	80%	80%
2		70%	75%	78%	80%	80%	80%	80%
3			70%	75%	78%	80%	80%	80%
4				70%	75%	78%	80%	80%
5					70%	75%	78%	80%
6						70%	75%	78%
7							70%	75%
8								70%
New Business Growth	1	2	3	4	5	6	7	8
NewBusiness policies	50,000	200,000	200,000	150,000	150,000	120,000	120,000	100,000

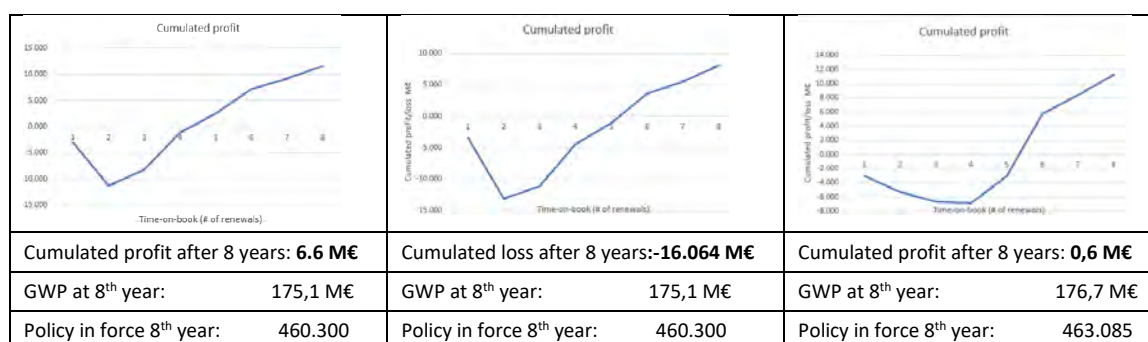
The following comments address these simplified assumptions. The parameters are representative of a direct motor business with a primary sales channel on the web, with minimal contribution from comparison sites. A target combined ratio of 80% is assumed for a mature cohort. The target size at break-even is around 450,000-500,000 policies in force, with the aim of maintaining this size, making a profit and recovering investments, without any further growth that would push the break-even point further forward, since, as noted above, growth must be financed in any case. More sophisticated assumptions can easily be used in the model to explore the sensitivity of the results to different business decisions.

Fig. 8 – Profit/Loss generated by different cohorts as a function of time-on-book.



Based on these assumptions, the single cohort profit is plotted on the left graph in Fig. 9 as a function of time on book. The cumulative result is calculated below the curve. The breakeven point is reached in the 4th year after losses of around €23 million. The portfolio size at the end of the 8th year is 460,300 policies with a GWP of approximately €175.1 million. The cumulated profit (excluding inflation) after 8 years is €6.6m and this size of operations is capable of maintaining a profit of €10 million per year in a steady state.

Fig. 9. Cumulated profit generated by different cohorts over years and cumulated value.



It should be noted that this model is highly sensitive to the input KPIs that drive the business objectives. In the event that competition and market conditions force an increase in the target new business PLR from 95% to 97% in order to achieve the planned growth, this small increase, with no other changes, will result in a one-year shift in the breakeven point, leading to a loss of approximately €16 million after eight years (Fig. 9, middle graph). If the target PLR of 95% is maintained, but the shareholder is unable to sustain the significant losses incurred in the second and third years and decides to pursue a more gradual growth trajectory, the projected business growth in years 2 to 5 will be adjusted as follows:

New Business Year	1	2	3	4	5	6	7	8
Basic growth scenario	50000	200000	200000	150000	150000	120000	120000	100000
Slower growth scenario	50000	100000	150000	200000	200000	120000	120000	100000

The breakeven point is then shifted forward by one year, resulting in a cumulative profit at the end of the eighth year of just €0.6 million. This is despite both the number of policies and the gross written premium at the end of the eighth year remaining relatively consistent. The model is therefore highly sensitive to all parameters. Furthermore, changes in the expense ratio result in significantly different outcomes.

9. Conclusion

In summary, by exploring different sets of Key Performance Indicators (KPI) this model allows a company to:

- quickly test and understand the impact of different assumptions
- help management understand that profitable growth in a competitive P&C market requires *both investment and time*
- measure both the investment and time required to breakeven and achieve significant return on equity

The two key drivers are the achievement of a profitable return on capital and the appetite for growth. The ultimate goal of a growing P&C business is to manage the trade-off between unprofitable new business and profitable renewals with the aim of maximising GWP growth within the capital limits set by the shareholder.

However, it is important to remember that models are one thing and real life is another. In real life, market conditions are not stable and in competitive markets changes can be frequent and significant. Models try to predict the future, but their information base is mostly in the past, so they will not predict the future with the accuracy you might expect. All models that predict renewal rates, average premiums and PCR can be dramatically affected by market changes, such as the entry of a new aggressive competitor or a change in behaviour by an old competitor, or even changes in regulation.

A very aggressive entrant will reduce projected renewal rates as more customers switch to take advantage of the lower prices available, and the company will need to respond in some way to retain its best customers and is likely to reduce its premiums. In addition, a change in regulation may alter expected renewal rates or increase expected claims costs. In such scenarios, profits may be lower than expected, PLR models may need to be updated and the balance sheet is likely to be affected. In general, the market reacts to the decisions taken by individual companies and planned results are lower than expected. This all boils down to two important lessons for the Board of an insurance company:

- invest heavily in knowledge, both in terms of data and qualified actuaries
- not to blindly believe in which model and which assumptions are being made.

Acknowledgement

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