SIMPLE AND EFFICIENT METRICS FOR PAY-AS-YOU-GO COMPANIES

Background

Pay-As-You-Go, or PAYGo, is a business model or payment system in which customers pay for goods or services as they use them. The model is often used in developing markets as it allows customers who may not have the means to make large upfront payments to make small and manageable payments while already having access to the goods or services they need. The market is expected to grow as more people in developing countries gain access to mobile technology and the need for affordable, accessible energy solutions increases. Despite its success in reaching millions of energy-poor, the PAYGo market has proven to be complex and challenging to navigate, both in terms of understanding the financials of individual companies and developing proper market standards. To address this, stakeholders in the PAYGo industry are working together in an attempt to standardize and improve industry metrics. This paper is written in the context of these efforts.

Objective

The paper aims to spark a conversation on the simplification and improvement of financial metrics in the PAYGo industry. It builds on the industry's efforts to standardize metrics by suggesting alternatives to some that require a large variety of data yet remain open to misinterpretation and can be misinformative. The intended result is to help provide stakeholders with efficient metrics to improve financial decision-making and increase financial transparency in the PAYGo industry.

Acknowledgements

I would like to thank Andy Keith, Solar Panda's Founder and CEO, for developing the cohort prediction methodology that inspired the methodology outlined in this paper, as well as for highlighting some of the deficiencies with current metrics and introducing important concepts such as the Static Portfolio Test and Calibration Period. My gratitude extends to Madeleine Gleave, Nithio's Chief Data Scientist, for the vibrant discussions held on PAYGo metrics and the comments received that have helped inspire this work. Lastly, I am grateful to Drew Corbyn, Bill Gallery, Oliver Reynolds, Lucia Spaggiari, Alasdair Lindsay-Walters and the rest of the PAYGo Perform Initiative team for their ongoing trial on the cohort analysis approach. Their work is anticipated to supplement and expand the conversation around this methodology.

Foreword

An efficient metric can be defined as simple, accounting-independent, and with outcomes that are consistent with the underlying data it seeks to showcase. While efforts to standardize and streamline PAYGo metrics are moving the industry in this direction, some metrics still require a wide range of data yet remain open to misinterpretation and can be misinformative. This can lead to limited financial transparency, inadequate accounting practices, and poor financial decision-making. To properly assess a PAYGo company's financial health and portfolio, it is essential to understand and monitor the following key elements:

- The variation in current and future payment profiles,
- The speed at which the future payments take place,
- The total value of the future payments (actual receivables),
- The unit economics implied by the payments,
- The future payments' capacity to cover the existing debt.

Consequently, the financial metrics and covenants used by the sector should be able to efficiently convey this information. This paper suggests that most of the key information needed to perform a robust financial analysis and comparison between companies can be extracted through cohort analysis using only two straightforward data points that are easy to report:

1. Total cohort contractual value,
2. Current monthly payments per cohort.

These data points are the most essential for a PAYGo company, and leave no room for interpretation. Additionally, because they focus on cash payments, they are comparable and independent of accounting decisions. To support this suggestion, a cohort payment profile was simulated to reflect the payments of twenty $200 systems:

Cohort	Cohort Month	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Cohort 1 (V1)	Jan-21	$ 389	$ 235	$ 233	$ 220	$ 214	$ 201	$ 190	$ 180	$ 171	$ 151	$ 142	$ 117	$ 110	$ 78	$ 53	$ 40	$ 28	$ 25	$ 20	$ 9	$ 12	$ 6	$ 4	$ 3

The simulation accurately reflects the payment profile of a standard cohort, where the first month's payment is typically higher due to initial deposits received, and subsequent payments gradually decrease over time. This decrease can be attributed to two factors: Firstly, some clients drop off from the system for various reasons such as accessing an alternative source (i.e. minigrid), acquiring an upgraded system, system issue/tempering, or a change in their spending priorities. Secondly, the remaining clients finalize their payments over time, leading to a gradual decrease in overall payments. This simulated cohort is used as the basis for the three sections of this paper:

1. Data processing: explains how to extract relevant information from the simulated cohort data,
2. Metric testing: explains how to evaluate the effectiveness of metrics created from the extracted information,
3. Efficient metric: presents efficient metrics that are built from the simulated cohort data and address all the PAYGo monitoring attention points listed above.

1. Data Processing

Based on the simulated cohort and using only the two mentioned data points, a simple and accounting-independent cohort payment table can be built.

Methodology

Since the average contractual value of the systems is $200, the total contractual value of this cohort is 20 x 200 = $ 4.000. Consequently, the cohort payment table equates to the monthly amounts divided by 4.000:

Cohorts	Cohort Month	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Cohort 1 (V1)	Jan-21	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%

The same methodology is applied to all historical cohorts to build a company's cohort payment table. In this fictive example, the same cohort payment profile was used over 2 years:

Cohorts	Cohort Month	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Cohort 1	Jan-21	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%
Cohort 2	Feb-21	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Cohort 3	Mar-21	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%
Cohort 4	Apr-21	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%
Cohort 5	May-21	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%
Cohort 6	Jun-21	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%
Cohort 7	Jul-21	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%
Cohort 8	Aug-21	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%
Cohort 9	Sep-21	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%
Cohort 10	Oct-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%
Cohort 11	Nov-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%
Cohort 12	Dec-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%
Cohort 13	Jan-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%
Cohort 14	Feb-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%
Cohort 15	Mar-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%
Cohort 16	Apr-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%
Cohort 17	May-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%
Cohort 18	Jun-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%
Cohort 19	Jul-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%
Cohort 20	Aug-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%
Cohort 21	Sep-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%
Cohort 22	Oct-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%
Cohort 23	Nov-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%
Cohort 24	Dec-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%

The historical cohorts can then be leveraged to project future payments by utilizing a two-step process:

- A weighted moving average is used, in which the following n^{th} month of a given cohort is projected as the weighted average n^{th} month of the past six cohorts, with additional weight given to the newest of the six cohorts. This enables to capture the most recent cohort-wide trends within the projection (vertical trends).

- The weighted average is then adjusted by a proxy that compares the current payment rate of the projected cohort to the weighted average payment rate of the past six cohorts, with additional weight given to the newest of the six cohorts. This enables to capture cohort-specific trends within the projection (horizontal trends), recognizing that how a cohort starts affects how it pays over time.

This methodology was used to forecast the next month of all cohorts:

		Actuals																						Forecast
Cohorts	Cohort Month	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
Cohort 1	Jan-21	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Cohort 2	Feb-21	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%
Cohort 3	Mar-21	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Cohort 4	Apr-21	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%
Cohort 5	May-21	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%
Cohort 6	Jun-21	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%
Cohort 7	Jul-21	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%
Cohort 8	Aug-21	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%
Cohort 9	Sep-21	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%
Cohort 10	Oct-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%
Cohort 11	Nov-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	4%	3%	3%	2%
Cohort 12	Dec-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%
Cohort 13	Jan-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%
Cohort 14	Feb-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%
Cohort 15	Mar-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%
Cohort 16	Apr-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%	4%
Cohort 17	May-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%	4%
Cohort 18	Jun-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%	4%
Cohort 19	Jul-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%	5%
Cohort 20	Aug-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%	5%
Cohort 21	Sep-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%	5%
Cohort 22	Oct-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%	5%
Cohort 23	Nov-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	6%	6%
Cohort 24	Dec-22	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	=AVERAGE

Some PAYGo companies have already found success using a simple moving average to predict various portfolios, achieving accuracy within 1% of the predictions when forecasting using the average of the 6 previous cohorts. The suggested methodology builds on this by giving more weight to the most recent cohorts and adjusting for specific trends within the cohort being projected. This methodology is suggested as a satisfactory balance between ease of use and the potential additional accuracy that could be obtained using more complex methodologies made possible by data analyzing third parties. The suggested methodology can be applied to the following months to obtain a full payment forecast:

		Forecast																						
Cohorts	Cohort Month	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24
Cohort 1	Jan-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 2	Feb-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 3	Mar-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 4	Apr-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 5	May-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 6	Jun-21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 7	Jul-21	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 8	Aug-21	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 9	Sep-21	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 10	Oct-21	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 11	Nov-21	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 12	Dec-21	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 13	Jan-22	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 14	Feb-22	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 15	Mar-22	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 16	Apr-22	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 17	May-22	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 18	Jun-22	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 19	Jul-22	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 20	Aug-22	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 21	Sep-22	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 22	Oct-22	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%
Cohort 23	Nov-22	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Cohort 24	Dec-22	6%	6%	5%	5%	5%	5%	4%	4%	4%	4%	3%	3%	2%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%

The data processing provides a full current and projected cohort payment table from which metrics covering all principle PAYGo monitoring attention points can be built. The timeframe used is equal to the time after which no material cohort payments are made. In this case, the simulated cohort shows no material payments beyond a 2-year timeline. Market data suggests that, for a given cohort, barely any payments are made beyond two times the contract period. The timeline can be adjusted if a PAYGo company has historical data showing that a material part of their cohort payments is collected beyond that.

2. Metric Testing

The two straightforward data points from which the cohort payment table is built make it simple and accounting-independent. The following section describes how to assess that the metrics built around the cohort payment table have outcomes consistent with the underlying data they aim to showcase.

The Static Test

A Static Test intends to see how a metric performs when each customer cohort has an identical payment profile. In the cohort payment table above, the same cohort payment profile was used over 2 years. To establish interpretable and noise-proof financial metrics built around the cohort payment table, their outcomes were subject to four different scenarios. In practice, portfolios are subject to a mix of the scenarios presented. The purpose of the Static Test scenarios is to effectively isolate each event so that the outcome of such an event can be distinctly identified and assessed. This enables to distinguish the efficient metrics from the inefficient ones.

Scenario 1: Constant number of sales per cohort, no cohort-wide change, no cohort-specific change

This scenario includes no specific event: the same number of systems are sold every month, and all cohort payment profiles remain constant throughout the test, meaning there are no cohort-wide or cohort-specific changes. The metric outcomes from this scenario serve as a reference to observe how the outcomes vary when events occur.

Scenario 2: Variable number of sales per cohort, no cohort-wide change, no cohort-specific change

This scenario only differs from the original scenario because the number of systems sold varies every month. It enables to isolate the impact varying sales have on metric outcomes.

Scenario 3: Variable number of sales per cohort, cohort-wide downcycle, no cohort-specific change

In this scenario, a cohort-wide downcycle event is applied in which all cohort payments of the last 6 months are reduced by 30% compared to the original simulated cohort payment profile. Among other things, it simulates the impact a significant event such as Covid or a country-specific event (political turmoil, war) can have on metric outcomes.

Scenario 4: Variable number of sales per cohort, no cohort-wide change, cohort-specific downcycle

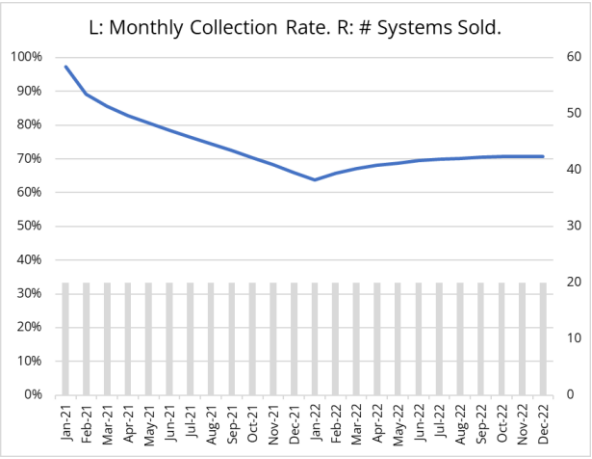
In this scenario, a cohort-specific downcycle event is applied in which all payments from the last 6 cohorts sold are reduced by 30% compared to the original simulated cohort payment profile. Among other things, it simulates the impact a defaulting new system or entry into a new market can have on the affected cohorts and the ensuing metric outcomes.

By using the same simulated cohort payment profile as the basis for all scenarios, the outcome of efficient metrics should be predictable. On the contrary, an inefficient metric will show unwanted noise. Therefore, when a metric is being considered, it should always undergo the test in which identical client payment profiles go through the four scenarios to validate whether it displays an outcome consistent with the underlying data it aims to showcase. This test can be referred to as the Static Test. The test enabled to identify efficient metrics and demonstrated the inefficiency of others, including the often-used Collection Rate.

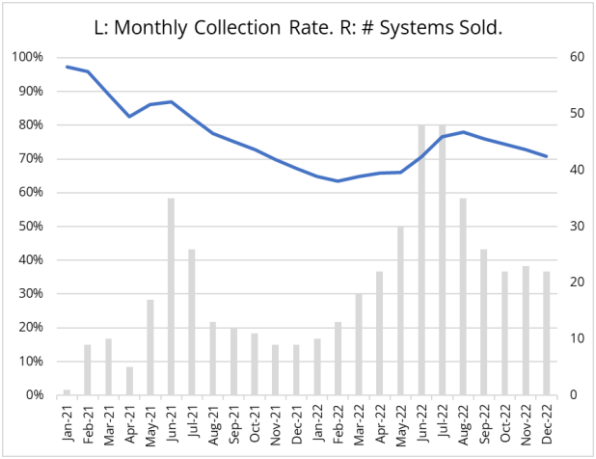
Inefficient Metrics

In the Static Test described above, scenarios 1 and 2 differ only by the varying number of systems sold. Since the simulated clients have identical payment profiles in both scenarios, any metric that aims to showcase a utilization or payment rate should showcase identical outputs. A compelling result is that of the Collection Rate, often used in the PAYGo sector. This metric divides the monthly payments collected by the total payments contractually due that month to reflect a company's ability to collect its receivables. The first attention point is that the metric requires additional data inputs, such as deposits and contractually due monthly payments, which increase the complexity of computing and reporting. For the purpose of testing, these were simulated to be 20 and 15 (x12 months) per system, respectively. The second attention point is that the metric relies on the definition of "contractually due", which can vary among companies and make it difficult to interpret and compare. In this example, anything beyond 1x the 12-month credit period was considered not contractually due. The third attention point relates to the consistency of the metric's outcomes with the underlying data it aims to showcase, for which the Static Test is used. Again, since the payment profiles are identical in scenarios 1 and 2, the outcome of a metric that aims to showcase client payment abilities or payment rates is expected to be identical:

Scenario 1: Constant sales, no cohort-wide/specific change



Scenario 2: Variable sales, no cohort-wide/specific change



Scenario 1 shows that the metric stabilizes around 71% after a certain time. Inversely, *scenario 2* remains unstable and shows a collection rate that varies between 63% and 78%. The fact that the curves presented are not exactly the same despite the underlying client payment profiles being identical implies that the metric is inefficient. De facto, it is being influenced by another data point that prevents the metric from correctly identifying actual variations in customer payment profiles.

In this case, the unwanted noise comes from the number of systems sold because clients pay better in the months directly following their purchase. Hence, the collection rate, if seen as a marker of client payment profiles, will always be distorted by variations in the number of systems sold. If seen as a measure of the compounding impact the payments have on the portfolio performance, it will be heavily dependent on the chosen definitions and accounting decisions and fails to effectively capture the underlying factors that drive this impact, such as changes in client payment profiles or variations in the number of sales. Both interpretations result in outcomes that are inconsistent with the underlying data they aim to showcase and therefore provide a misleading representation of the data.

The same approach can reveal similar inefficiencies in other metrics commonly used in the industry, such as Receivables/Portfolio at Risk (RaR/PaR) and RaR/PaR + write-offs. These metrics are heavily dependent on accounting principles which can vary widely between companies (definition of "at risk"? write-off policy?) and can be manipulated to achieve desired outcomes. Even with a fixed accounting policy, their outcomes remain flawed. For example, a company with constant sales and the same average client profile would still see its RaR/PaR X and RaR/PaR X + write-offs continuously decrease over time if its accounting policy is to never write-off. This is because the pool of unpaid receivables would infinitely increase over time, even though it would not affect the company's underlying cash collections since their sales and client profiles are constant. Therefore, beyond their dependency on definitions and accounting policies, these metrics fail to effectively capture the information that matters when discussing receivables: accurately representing the total value of receivables and understanding how and when they are paid.

A separate point to consider while assessing the efficiency of a metric is the calibration period. This is the time it takes for a metric to stabilize before reliable conclusions can be drawn from the data. In the collection rate example, it takes nearly two years (twice the 12-month contractual period) for the metric to stabilize in scenario 1. This is due to its dependencies on the length of the contract period and the slope of the payment curves (the fact that it takes 2x the contract period before which no material payments still take place). Metrics with a long calibration period can be inefficient when assessing early-stage companies with limited historical data.

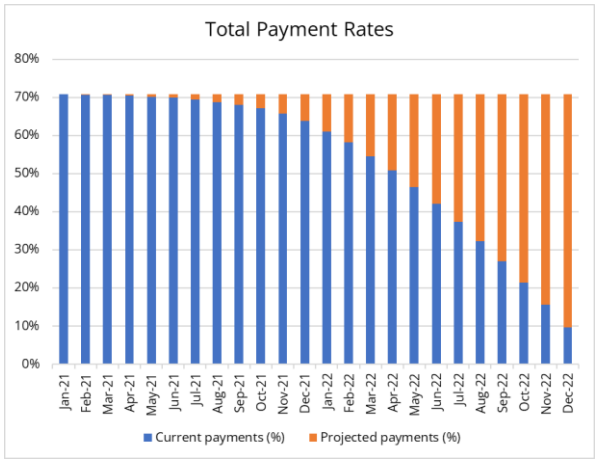
3. Efficient Metrics

An efficient metric is simple, accounting-independent, and with outcomes that are consistent with the underlying data it aims to showcase. The following section presents five metrics that efficiently cover the PAYGo monitoring attention points. All metrics below are based on the payment table presented in the Data Processing section, and therefore, they all derive from two simple, easy-to-report and accounting-independent data points. To illustrate their effectiveness, their outcomes under the 4 scenarios of the Static Test are presented and commented.

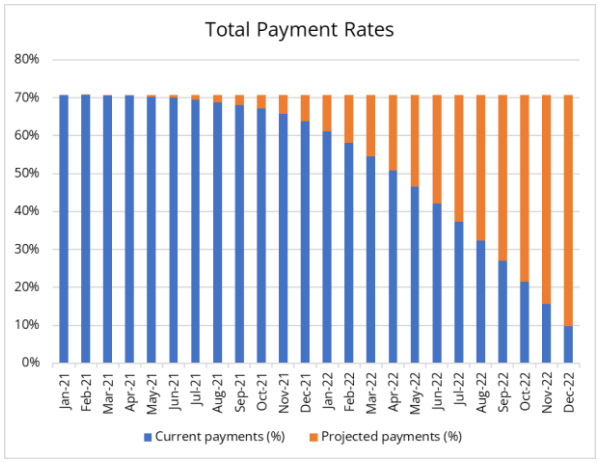
1. Total Projected Cohort Payment Rates

The Total Projected Cohort Payment Rate is a metric that sums the total of current and projected payment rates per cohort. In the graphs below, each monthly cohort is represented on the X-axis:

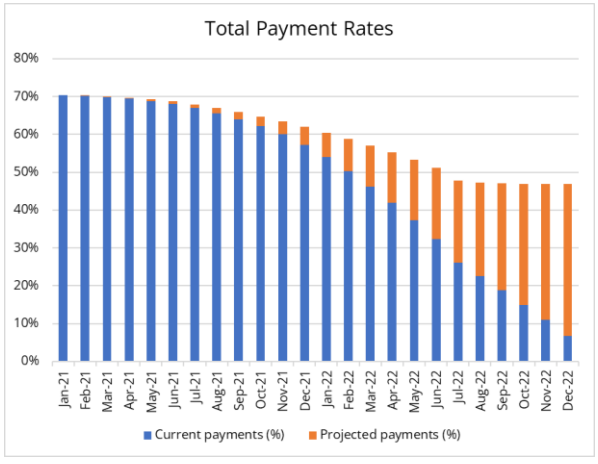
Scenario 1: Constant sales, no cohort-wide/specific change



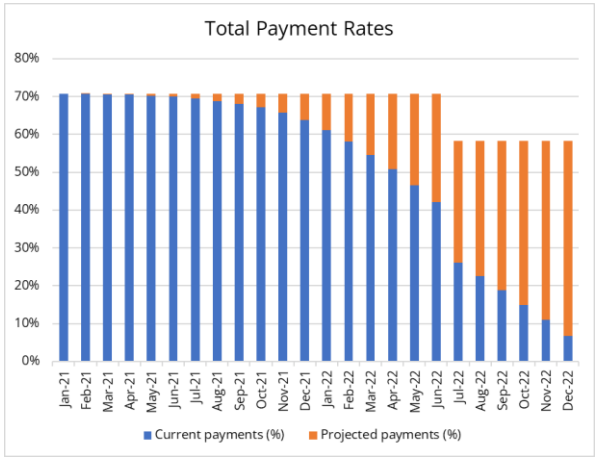
Scenario 2: Variable sales, no cohort-wide/specific change



Scen. 3: Variable sales, cohort-wide downcycle



Scen. 4: Variable sales, cohort-specific downcycle



The Total Projected Cohort Payment Rate is an effective metric that provides a clear view of the impact of market changes on cohort payments, eliminating any interference from variations in the number of sales (as demonstrated by the output of scenarios 1 and 2 being identical). The metric helps anticipate the final amounts (current + projected) paid per cohort and track how payment trends are evolving. In scenario 3, the metric efficiently showcases that a late downcycle negatively

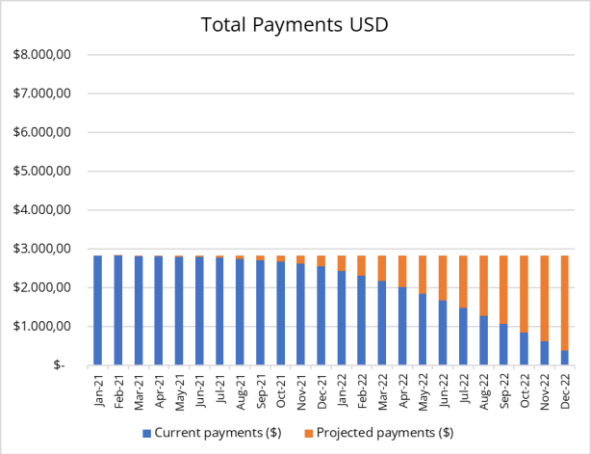
impacts the payment rates of all cohorts, with a greater impact on newer cohorts. This is because older cohorts are already mostly paid, limiting the late downcycle's impact on their final payment rates. In scenario 4, the metric efficiently showcases that a late cohort-specific issue only affects the payment rates of the cohorts in which the issue has been observed.

In addition to the metrics' ability to showcase market changes, it can assist a company in booking its revenue and receivables. For example, if a cohort has a book value of $4.000 and its projected total cohort payment rate is 70%, the company should book a 30% provision/expected credit loss upfront such that the net revenue is 70% of the $4.000 contractual value rather than the full amount, as is commonly seen in the PAYGo market. This approach of booking revenue and receivables based on what is expected to be paid is transparent and allows for a more accurate assessment of a company's financial health. It promotes sound financial decision-making and enables to build adequate budgets to ensure proper liquidity management, the Achilles heel of PAYGo companies.

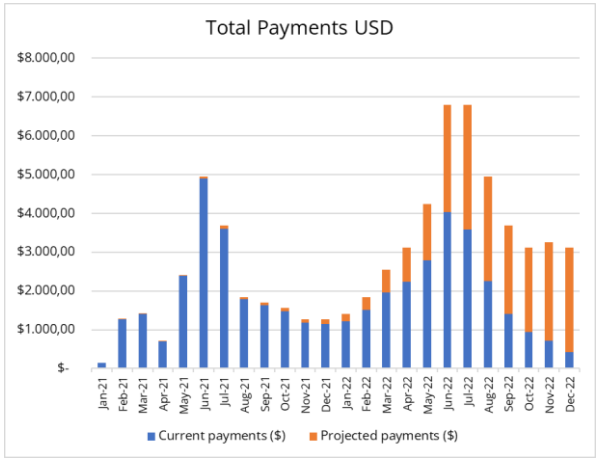
2. Total Projected Cohort Payment (USD)

The Total Projected Cohort Payment (USD) is similar to the previous metric, but it presents the outcome in terms of absolute dollar value.

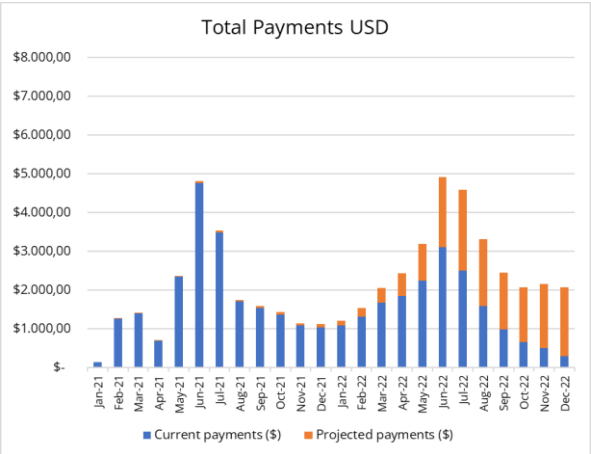
Scenario 1: Constant sales, no cohort-wide/specific change



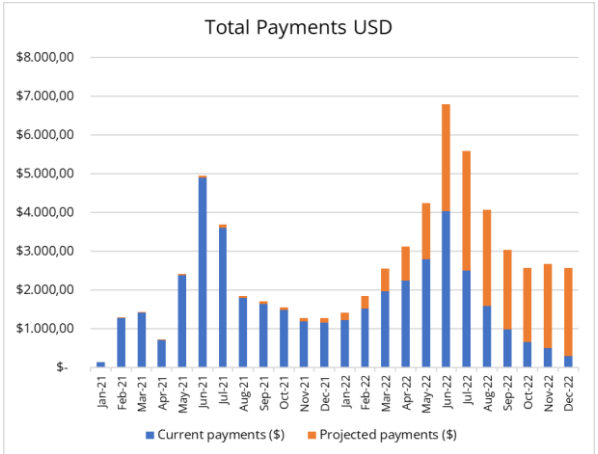
Scenario 2: Variable sales, no cohort-wide/specific change



Scen. 3: Variable sales, cohort-wide downcycle



Scen. 4: Variable sales, cohort-specific downcycle



The Total Projected Cohort Payment (USD) metric displays the total projected cash generated by each cohort. Similar to the previous metric, it can be used to book revenues more accurately. Furthermore, this metric gives an understanding of the scale of cash generated and enables to assess robust unit economics by dividing cohort costs by the total projected cohort payments.

3. Cohort Contribution Margin

An alternative way to look at unit economics is to divide the Total Projected Cohort Payments by the Total Cohort Costs to understand whether the cohorts are positively contributing to the business:

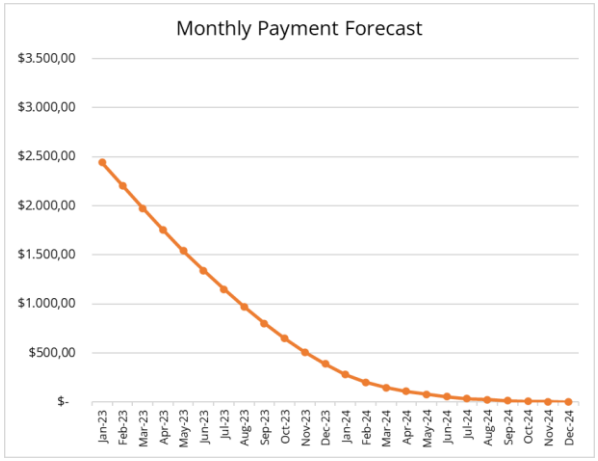
$$\frac{Projected\ Cohort\ Payments\ (\$)}{Cohort\ Costs}$$

The metric provides a cohort break-even point. Total Cohort Costs can be limited to variable costs or include fixed costs or/and debt servicing. The choice would need to be fixed when performing cross-company comparisons.

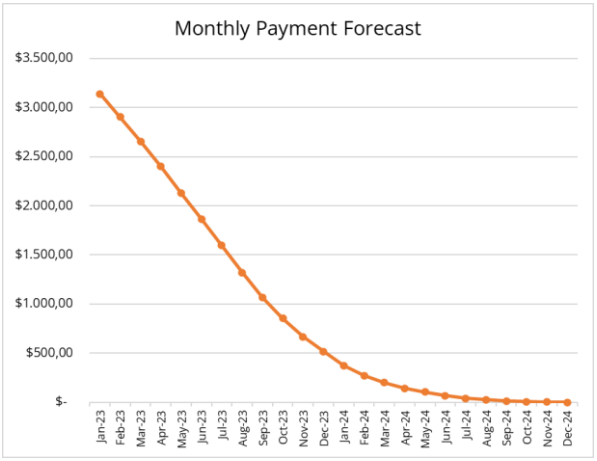
4. Monthly Payment Forecasts

The Monthly Payment Forecasts metric reflects all the expected payments to take place in the following months. In the graphs below, the future reporting months are represented on the X-axis:

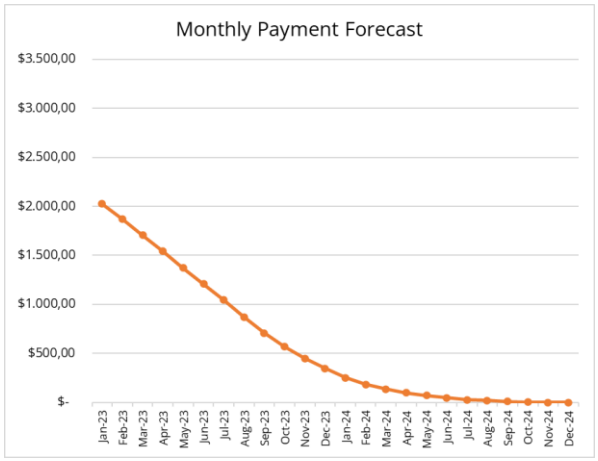
Scenario 1: Constant sales, no cohort-wide/specific change



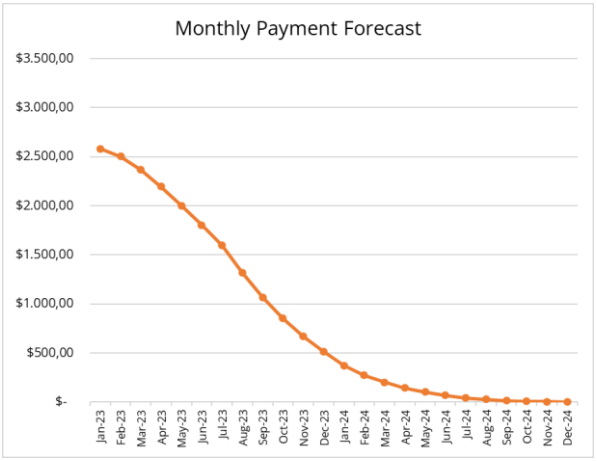
Scenario 2: Variable sales, no cohort-wide/specific change



Scen. 3: Variable sales, cohort-wide downcycle



Scen. 4: Variable sales, cohort-specific downcycle



The Monthly Payment Forecasts metric provides a comprehensive estimate of the total receivables that should be booked, independent of accounting policies, and illustrates when and how these receivables are expected to be paid. These are the key considerations when discussing receivables, and effectively monitoring them improves financial transparency and promotes sound financial decision-making.

5. Debt Coverage Ratio

Divides the total projected payments by the total debt:

$$\frac{Total\ Projected\ Payments\ (Receivables)}{Total\ Debt}$$

Using the total projected payments in the debt coverage ratio allows for a more accurate estimation of the coverage of existing debt. This approach differs from using receivables booked at full sale value to which a discount is applied, which is commonly seen in the PAYGo market.

Conclusion

The PAYGo industry is making progress in standardizing and adopting more efficient metrics, but some still require a large variety of data and are prone to misinterpretation. Such limitations can affect financial transparency and hinder effective decision-making. Efficient metrics should strive to be easy to report and interpret, independent from accounting practices, and deliver consistent outcomes. This paper suggests that efficient metrics covering all main PAYGo financial focus points can be obtained through cohort analysis using two simple data points:

1. Total cohort contractual value,
2. Current monthly payments per cohort.

The proposed methodology for projecting cohort payments involves using a moving average that gives more weight to recent cohorts and accounts for specific trends within the cohort being projected. From the cohort payment table, metrics can be developed to perform a robust financial analysis and comparison between companies. The paper recommends that when a metric is being considered, it should always be tested using identical client payment profiles in four specific scenarios to ensure that it accurately reflects the underlying data it aims to showcase. This test is referred to as the Static Test, and it has helped demonstrate the inefficiency of certain metrics, such as the commonly-used Collection Rate, and identify efficient metrics that cover the main PAYGo financial focus points:

- Variation in current and future payment profiles,
  - ☑ *Total Projected Cohort Payment Rates*
  - ☑ *Total Projected Cohort Payment (USD)*
- The speed at which the future payments take place,
  - ☑ *Monthly Payment Forecasts*
- The total value of the future payments (actual receivables),
  - ☑ *Total Projected Cohort Payment (USD)*
  - ☑ *Monthly Payment Forecasts*
- The unit economics implied by the payments,
  - ☑ *Total Projected Cohort Payment (USD)*
  - ☑ *Cohort Contribution Margin*
- The future payments' capacity to cover the existing debt.
  - ☑ *Debt Coverage Ratio*

The paper suggests that:

1. **The two data points: Total cohort contractual value and Current monthly payments per cohort, serve as the foundation of financial reporting.**
2. **The metrics presented in the paper should be adopted as reporting standards as they are deemed efficient and cover the key financial focus points.**

3. **Any additional metric should be subject to the Static Test to ensure that it accurately reflects the underlying data it aims to showcase.**
4. **Revenue and receivables should be provisioned for upfront based on what is projected to be received rather than being booked at full contractual value with no provisioning.**

Recommendations for further research

1. Conduct additional tests on the forecasting methodology to determine the optimal balance between ease of use and accuracy. This can be achieved by modifying the proposed methodology (i.e. testing the use of a simple moving average if its simplicity sufficiently offsets its lack of consideration for intra-cohort specificities) or exploring more advanced methodologies with the help of data analyzing third parties. Such analysis is now being conducted by the PAYGo Perform Initiative.

2. Conduct additional Static Testing on potential PAYGo metrics to improve or disprove their effectiveness.

About the author:

Guillaume Cruyt
Investment Associate – EDFI Management Company
g.cruyt@edfimc.eu
+32 474.57.00.64

About the EDFI Management Company

The EDFI Management Company (EDFI MC) was established in 2016 to serve as a common platform for developing innovative partnership models between the European institutions and European DFIs. EDFI MC delivers development finance solutions that enable European DFIs and private sector investors to increase the scale and impact of their work. These solutions allow them to focus on those business models, technologies and geographies where they have not been able to operate at the desired scale, given their resources and investment criteria. It places a particular emphasis on sectors that are critical to sustainable development, such as access to energy (EDFI ElectriFI) and sustainable agriculture (EDFI AgriFI).
www.edfimc.eu