CREDIT LIFE CYCLE FORECASTING MODEL

Progress Presentation

Research practice 3

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April 08, 2016

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Introduction

Bancolombia counts with a strategy for an integral administration of risks, that points towards the identification, measurement, monitoring and mitigation of the inherited risks of the organization.

- **Credit risk**: it is the possibility of incurring in losses when a third party fails to fulfill its obligations partial or totally. This translates in deterioration of the credit quality.

Concepts

According to the glossary of terms defined by Superintendencia Financiera de Colombia.

- **Performing Loans**: total amount of loans whose principal and interest are up to date.
- **Overdue portfolio**: capital, shares or interests of the total amount of credits that have not been paid in a period of time longer than 30 days
  - 30 days past due
  - 60 days past due
  - 90 days past due

Concepts

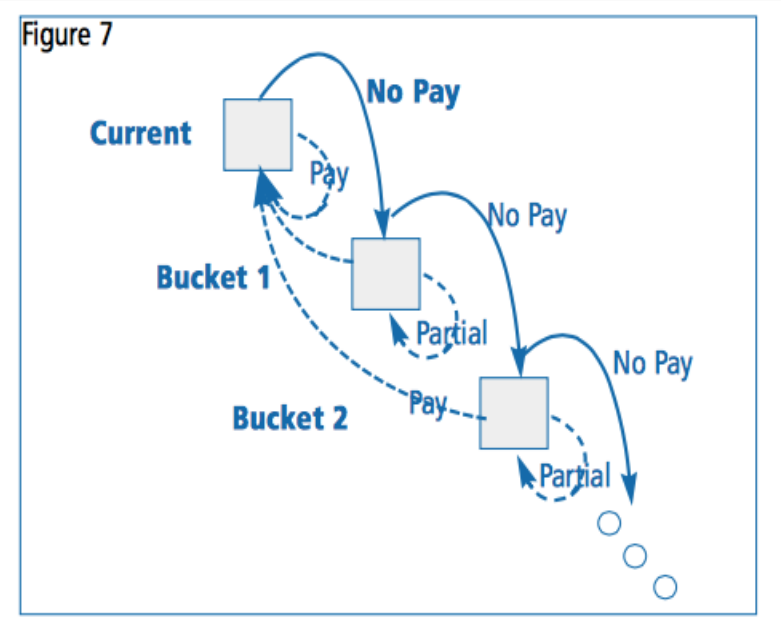
- **Allowance**: collection of money that tries to lighten the impact in case of default by the third party
- **Write off**: countable operation that gives treatment to the losses of an amount before considered as an asset.
- **Allowance expense**:

$$E_t = A_t - A_{t-1} + W_t,$$

E_t: Actual allowance expense
A_t: Actual allowance
A_{t-1}: Past allowance
W_t: Actual written offs

Forecasting Model

The model considers tendency and seasonality of the events occurred in the past to forecast the future using **Markov Chains**, its important to precise that the model has quarterly forecasts



Discrepancies were noticed and external parameter was included, this parameter is moved in a very empirical way.

figure:www.strategicanalytics.com/pdf/RMAJ200310ForecastTools.pdf

Model Diagnosis

MAD

Type of error which measures the mean of the absolute deviations of the forecast errors

$$MAD = \frac{\sum_{i=1}^{n} |x_i - \hat{x}|}{n}$$

where:
x_i: real value
$\hat{x}$: forecasted value

RMSE

Quantitatively evaluates the accuracy of forecasts. This calculation, compared with MAD, amplifies and strongly penalizes those errors of greater magnitude.

$$RMSE = \sqrt[2]{\frac{\sum (x_i - \hat{x})^2}{n}}$$

Model Diagnosis

MAPE

As an measure of error independent of any scale is commonly used to evaluate and compare accuracy.

$$MAPE = \frac{\sum_{i=1}^{n} |\frac{e_i}{x_i}|}{n} * 100$$

where

$$e_i = y_{real_i} - y_{forecast_i}$$

Theil's U

U_1 which evaluates the forecast accuracy. U1 is bound between 0 and 1, with values closer to 0 indicating greater forecasting accuracy.

$$U_1 = \frac{\sqrt[2]{\sum (x_i - \hat{x})^2}}{\sqrt{\sum x_i^2} + \sqrt{\sum \hat{x_i}^2}}$$

Diagnosis Results

Errors	REAL/FORECAST 2014-2015			
	RMSE	MAD	MAPE (%)	U1
Balance	128.269	85.407	2.8	0.084
Performing Loans	127.693	80.705	3.0	0.094
Disbursement	55.490	37.775	15.5	0.541
$>$ 30 past due	9.907	7.583	5.4	0.156
31-60 past due	5.037	4.582	11.1	0.249
$>$ 60 past due	6.816	5.486	5.8	0.160
A. Expense	3.509	2.692	27.0	0.686
Written offs	3.030	2.584	37.9	0.696

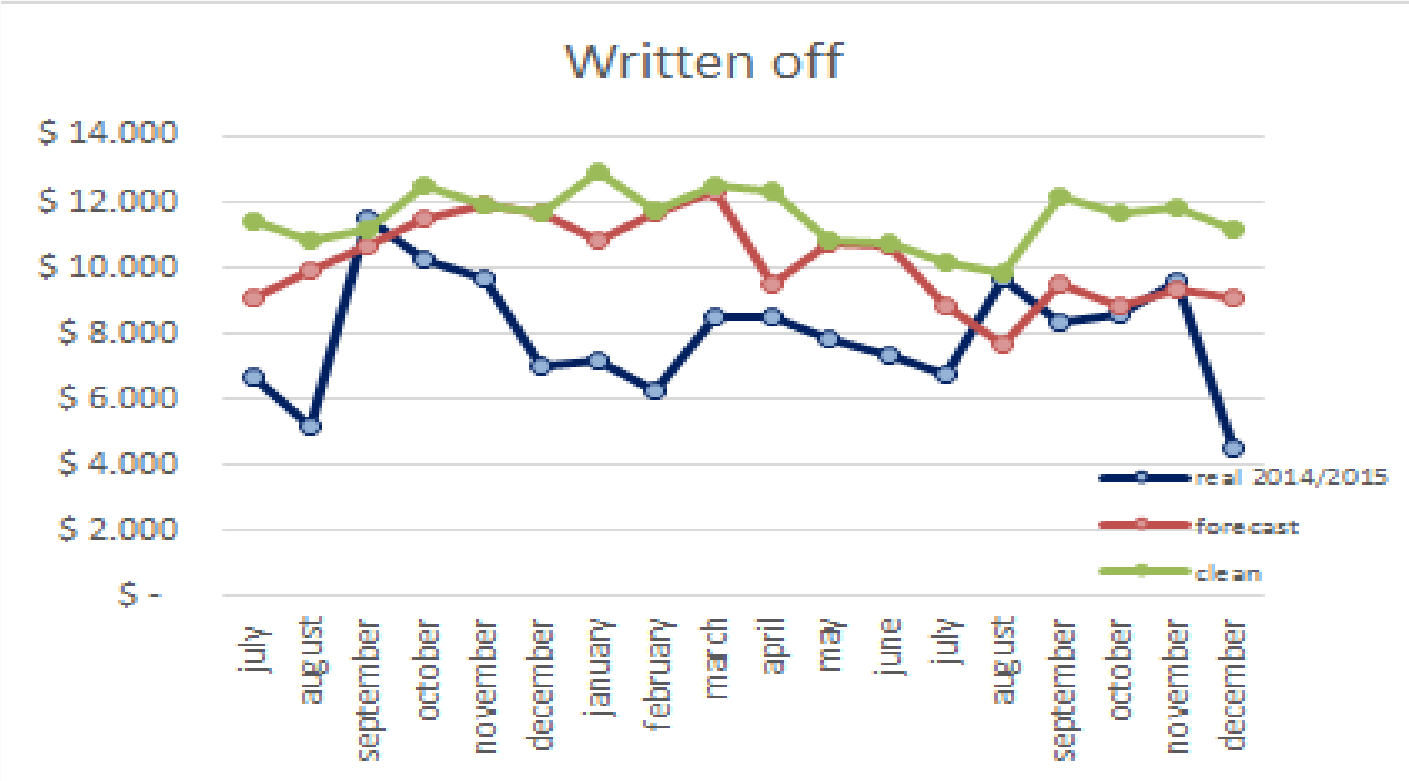
Table: Errors of the forecasting model

Diagnosis Results

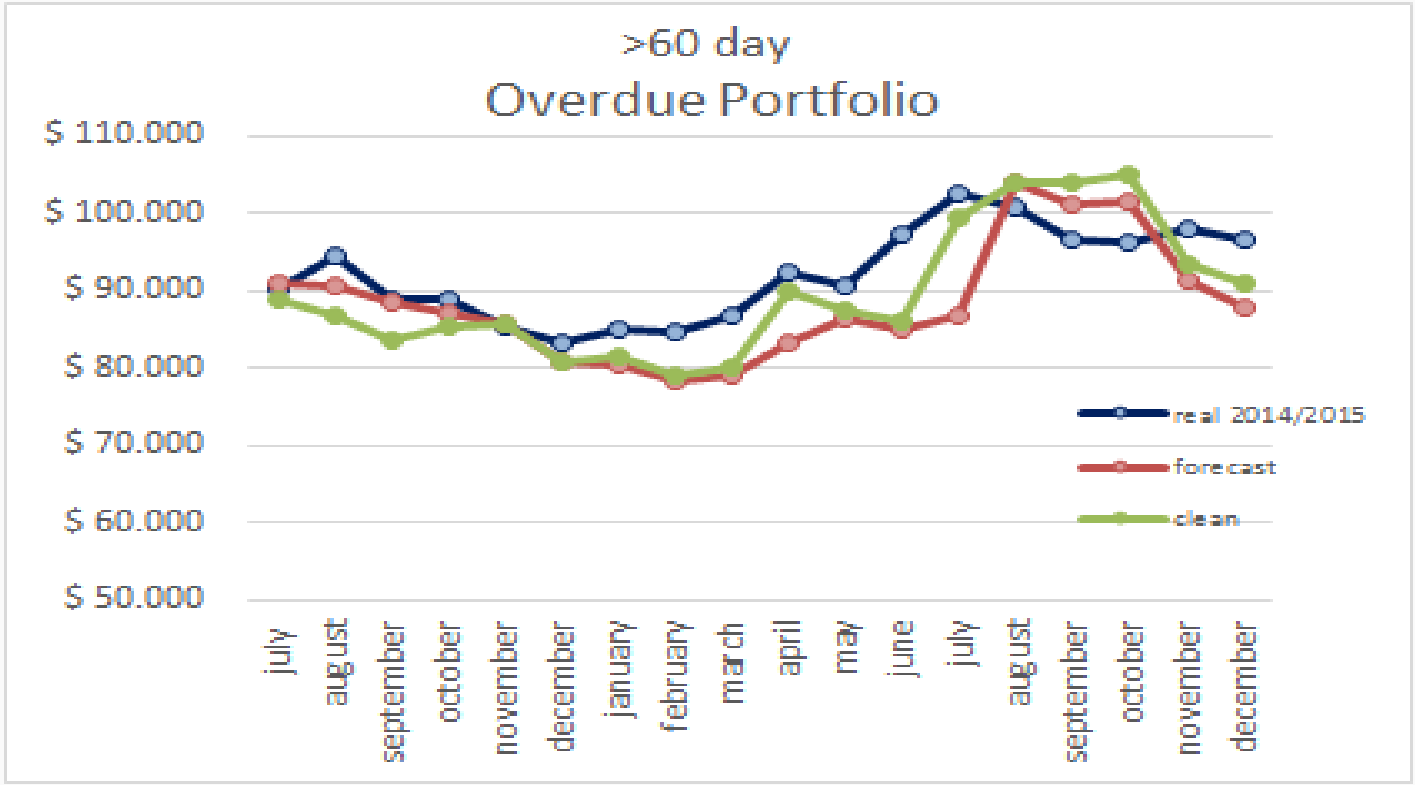
Errors	REAL/CLEAN 2014-2015			
	RMSE	MAD	MAPE (%)	U1
Balance	128.269	85.407	2.8	0.084
Performing Loans	127.693	80.705	3.0	0.094
Disbursement	55.490	37.775	15.5	0.541
$>$ 30 past due	8.319	5.707	4.1	0.132
31-60 past due	5.085	4.500	10.7	0.250
$>$ 60 past due	5.556	4.829	5.2	0.129
A. Expense	3.902	3.294	35.9	0.719
Written offs	3.979	3.594	52.2	0.856

Table: Errors of the forecasting clean model

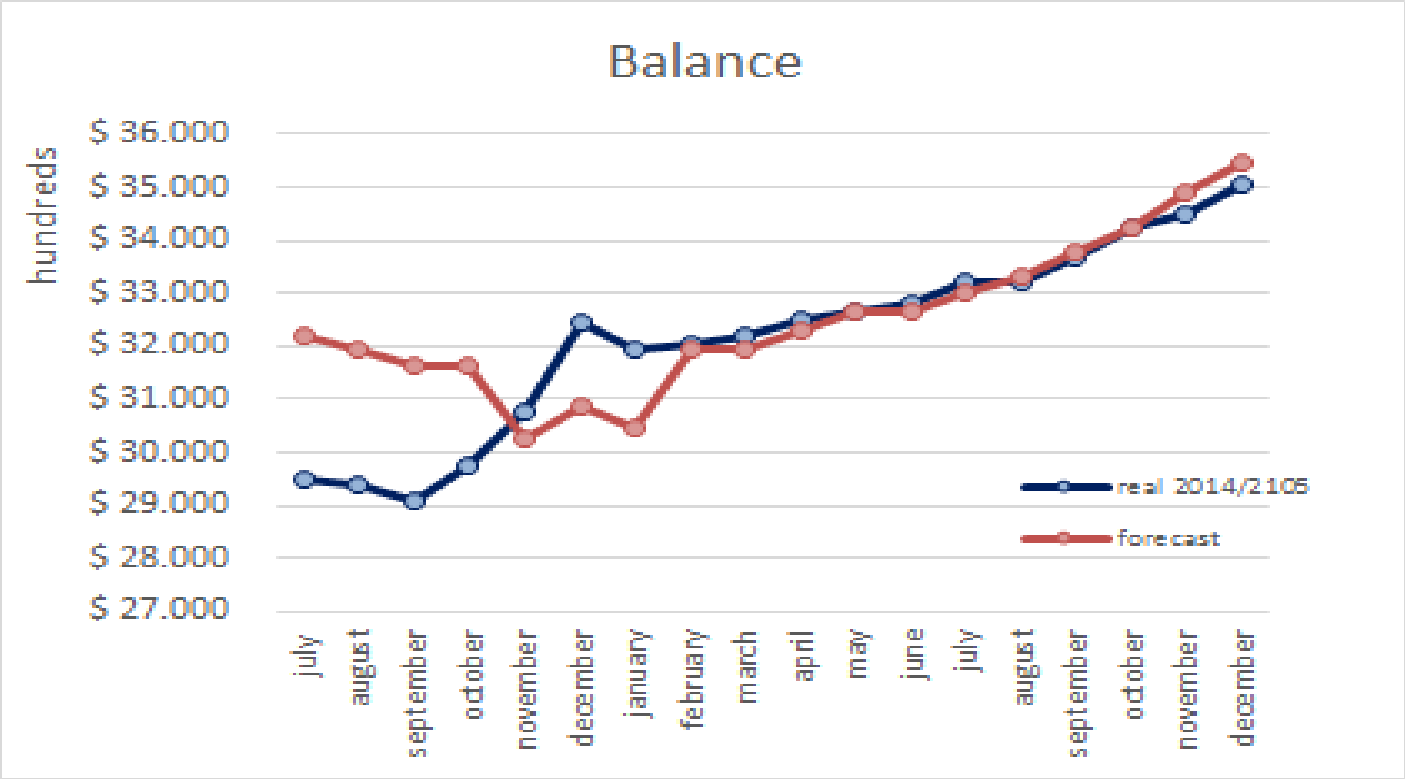
Diagnosis Graphic Results



Diagnosis Graphic Results



Diagnosis Graphic Results



Diagnosis Results

To evaluate the impact, a weighted error was calculated based on the allowance expense it generates. As the only precise information obtained is the total amount of allowance expense a historical distribution of the same across the concepts had to be calculated:

%	Disburs.	P. loans	31-60	>60	Cancel	W. offs
2014	65.6	-62.5	24.7	122.6	-50.3	-104.3
2015	70.4	-48.4	20.8	104.5	-47.3	-81.8
total	67.8	-56.2	22.9	114.4	-49	-94.1
Avg.	67.1	-52.4	22.3	109.4	-49.8	-88.9

Table: Historical distribution of the allowance expense

Diagnosis Results

There is a spending released each time a credit is canceled for this reason should take into account cancellations C_t:

$$C_t = B_{t-1} + D_t - B_t$$

where:
B_{t-1}: real balance $t-1$
B_t: forecasted balance t
D_t: forecasted disbursements in t

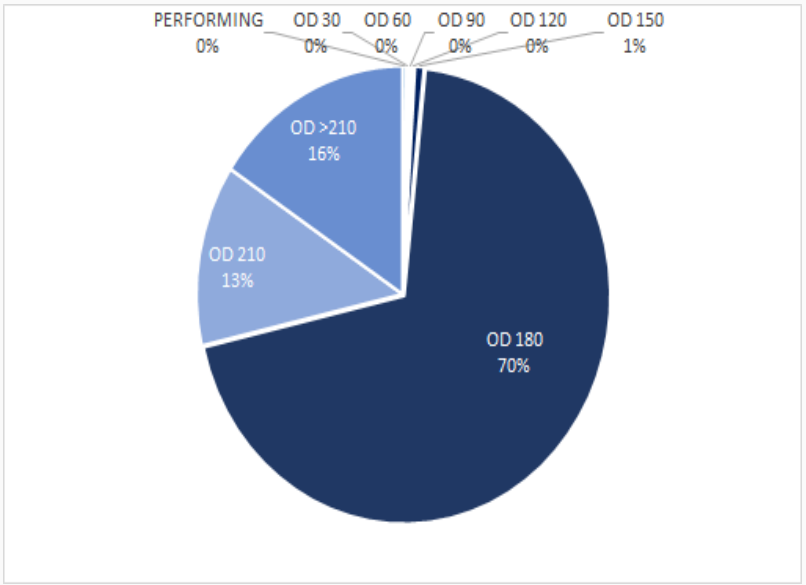
Diagnosis Results

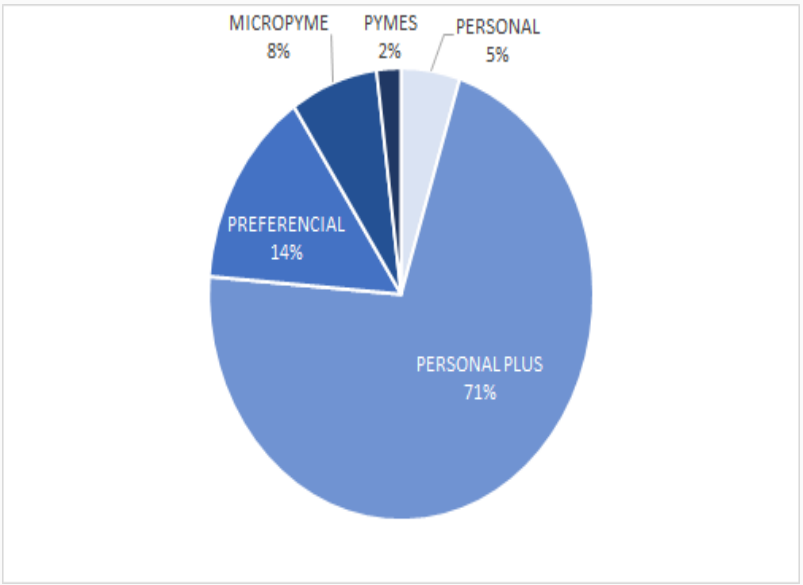
CONCEPTS	MAPE	Expense (Millions)	Participation	W. Error	
P. Loans	3.0%	-16.505	54%	1.6%	↓
Cancel	18.5%	-15.717	51%	9.4%	↓
Disburs.	15.5%	17.698	58%	9.0%	↓
31-60	11.1%	7.571	25%	2.8%	↓
>60	5.8%	37.506	123 %	7.1%	↑
Written off	37.9%	32.641	107%	40.6%	↑
Total		30.553			

Table: Weighted Error

Diagnosis Results

After analyzing the calculated errors and the weighted error, it can be clearly seen that the concept that has a greater error while being forecasted are the written offs. For these reason this will be the first concept to be intervened in the model.





where OD is the overdue loan in the different default buckets

Objectives

General: Develop an intervened a forecasting model for the credit life cycle concept(s).

Specific:

- Measure the quality of the actual**–> done**
- Study different models capable of forecasting. **–> started**
- Study external variables **–> started**
- Extract all the information needed **–> started**
- Implement an improved model **–> remains to be done**
- Measure the accuracy of the model **–> remains to be done**

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Questions?