|  |  |  |
| --- | --- | --- |
|  | | |
| **Institutional Client Retention Summary**  **Document** | | |
|  |  | |
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| **Author:** LatentView | |  |
| **Date:** 22 November 2017 | |  |
| **Version: 1.2** | |  |
|  | | |

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# Engagement background

## Background

LatentView started to engage with SLI with a three-week consulting study phase in August 2016. After meeting with various stakeholders and a high-level understanding of the available data it was mutually decided that LatentView team will work on the following to enhance the client retention.

### Enhanced Control for Institutional Client Relationship Management

Pain Points:

Single Dimensional Risk view based on Client Director’s interactions

Focus primarily on larger clients

Timely interventions based on other factors (fund performance, unresolved cases etc.) was not possible

Project Brief:

Produce an alternate risk view based on other dimensions (detailed below) to increase efficiency by drawing attention & enabling application of consistent rigour across total institutional client base

## Scope

The scope of the Client risk identification is to:

1. Identify relevant data sources from client interactions, transactions, fund performance etc. that can be used to identify client risk
2. Define the Target variable appropriately
3. Assimilate the relevant data from above sources
4. Profile the data to understand the relationship between independent variables and the dependent target variable
5. Build a classification model to classify the client risk
6. Identify the triggers/significant variables that were contributing to the client risk.

# Problem Definition

After the initial study, we were able to find out that there were,

* 2498 Clients
* 13,604 Prospects
* 445 Former clients

which summed up to a total of 16,547 institutional accounts in the database.

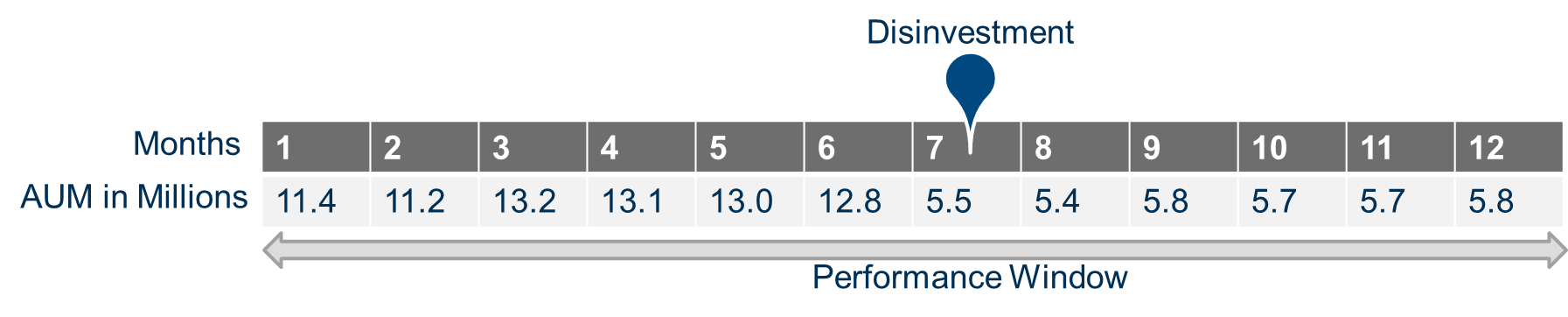
The main objective of building a Retention model is

* To identify active clients who are more likely to disinvest
* To understand driving factors behind disinvestment

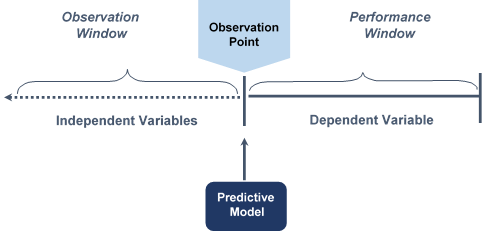
Since the investments were through mandates and clients can invest through more than one mandate, the target was redefined to look at a mandate risk rather than a client risk.

**Target Variable**: An event is defined if any mandate’s AUM reduces by more than 50% in the next 12 months from the observation month.

Considering a mandate ABC with an AUM of 11.4 million, if in the next one year, the AUM of the mandate decreases to 50% or less than its value at point x, then it is considered as ‘Disinvestment’.



The problem was modeled as given below.



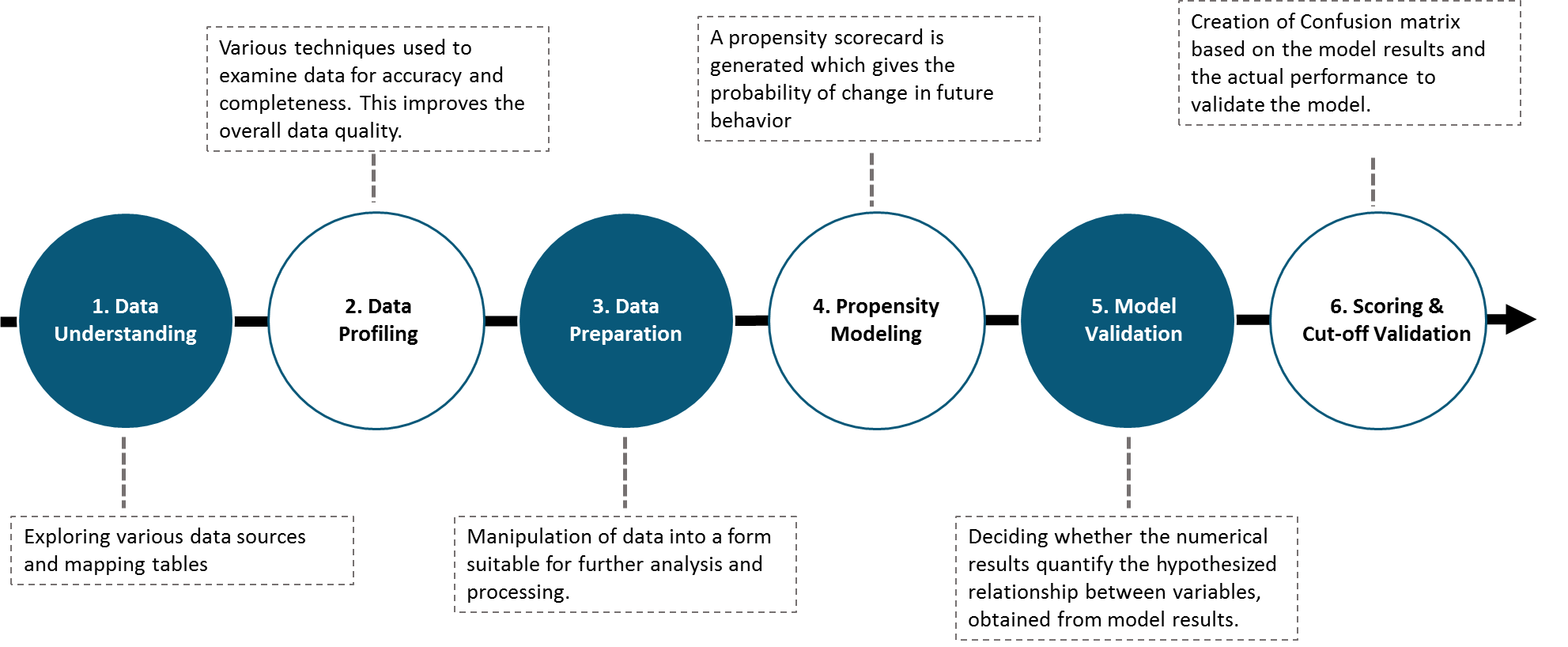
**Observation Window:** All the explanatory variables were created up till this point

**Performance Window**: Performance window of 12 months was chosen for the following reasons

* The performance window should be long enough to have enough events
* In general, Financial industry scorecards are designed to predict the likelihood of some event occurring over the next 12-24 months
* The event rate was increasing till the 12th month

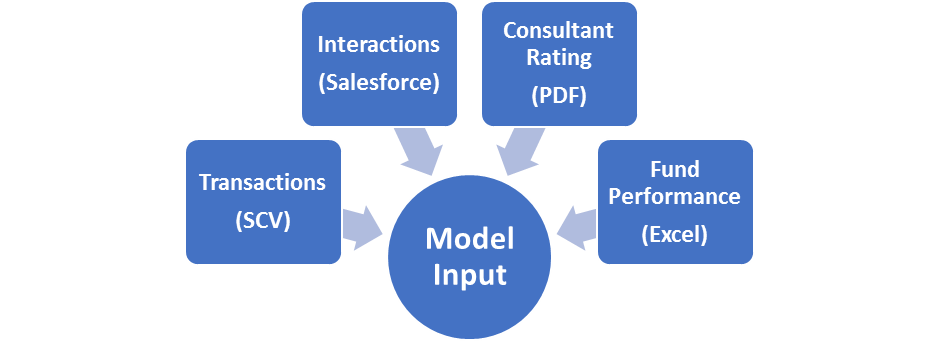
# Process Overview

The following steps were followed in this project.



# Data Understanding and Sourcing

The data available in the following sources were used for creating variables to be used in the model:



## Single Client View

The transactional and financial information was fetched from the Single Client View (SCV) Cube. Number, Amount and Recency of transactions were extracted for initial analysis. Restructuring in the Client Relationship Team of any specific client was also taken into consideration.

The transaction details give the cash flows data at mandate level which will be used as an input to the model. The following metrics were captured during this process: Money In, Money Out, Switch In, Switch Out, Transfer In and Transfer Out.

Transaction details were pulled from SCV, fed into the sql development database and required data was extracted.

* [**Number of Transactions**](#_Number_of_Transactions:)**:** Total number of transactions in last 3 months, 6 months, 9 months and 12 months.
* [**Percentage of Transactions**](#_Percentage_of_Transactions:)**:** Transaction percentage in last 3 months, 6 months, 9 months and 12 months. (For E.g.: For last 3 months – Sum of transaction amount in last 3 months/ Max AUM in 3 months)
* [**Transaction Days**](#_Last_Transaction_Days:)**:** Days since last transaction was executed.

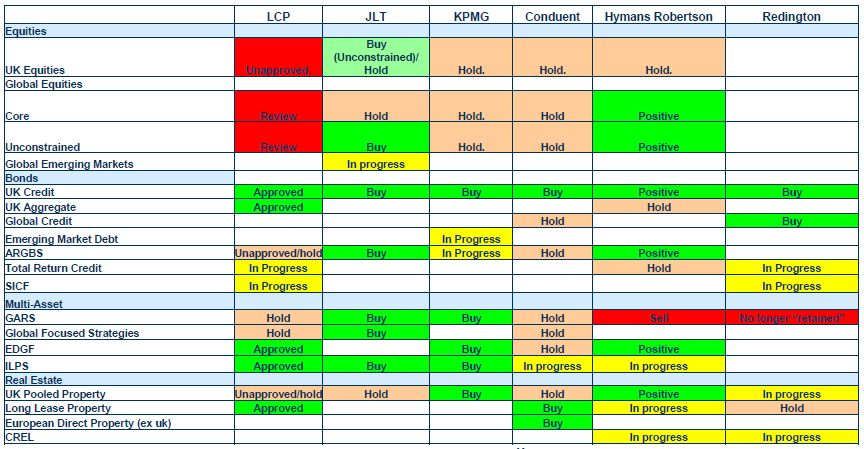
## Consultant Ratings

The impact of rating of funds provided by 18 major consultants were analysed. The various ratings provided by them for a fund group/Asset class are:

* Buy
* Soft Buy
* Hold/Maintain
* Sell

The consultant ratings were available only in the form of PDF documents. The data was in fact was an image in the PDF, depriving us to use it through programmatic ways. The required data was converted into usable form from the consultant rating pdf every month. Fund Group, Consultant Name and Rating was being captured manually in excel and then joined with trelationship table to get the mandate level details.

Consultant Rating PDF Sample



The data was neither complete nor consistent. Ratings were available for only 39% of the funds considered for analysis.

Data Extraction Steps:

* A mapping system was created assigning a rank to every rating.

|  |  |
| --- | --- |
| **Rank** | **Rating** |
| 1 | Buy |
| 2 | Soft Buy |
| 3 | Hold |
| 4 | Sell |

## Fund Performance

The Contribution of performance of funds considered in the form of Geometric Relative Returns to disinvestment was analysed.

The independent variables were formulated based on the data available in the various data sources discussed above. Number, Percentage, Frequency and Recency were some of the forms of variables created from the cleaned data. Relative returns were available only for 26% of funds.

Data Extraction Steps:

* Fund composition for every mandate was calculated based on the percentage of AUM in each of the funds. The fund with the highest Fund composition was taken as the lead fund and the **Fund performance was computed only for the Lead Fund**
* For Multi Asset, we extract fund performance based on the currency in which the investment has been made in the fund.
* For fixed income we consider only total level business group.
* In case of two currencies being present for a mandate-fund combination, we choose the performance of the currency with the higher AUM.

## Salesforce

Client specific data and Marketing Contact and Engagement of the client were extracted from Salesforce. *Frequency* and *recency* of the interactions of the client with SLI and data about the segment to which the client belongs, e.g. account type and subtype.

Salesforce tables were populated from Exact Target (salesforce marketing cloud). The numbers present in Exact target were not aligned with the numbers in the salesforce tables.

### Email

*Reach*, *Engagement* with clients through emails captured as model inputs: # of Emails, # of Opens, # of Clicks

*Frequency* of emails were captured by calculating the number of emails in the last 3, 6, 9 and 12 months

*Recency* metric(s): the number of days since last email

### Campaign

*Reach* & *engagement* with clients through campaigns as an input to the model: # of Invites, # of Responses. Frequency of campaigns was captured by calculating the campaigns in the last 3, 6, 9 and 12 months.

*Recency* of campaigns metric: number of days since last campaign

### Events

Client directors/Relationship Managers have interactions with institutional contacts through telephonic or face-to-face meetings. The details of meetings were recorded through meeting notes including the tone of the meeting.

The following metrics captured from campaign tables as an input to the model:

* Tone of the meeting
* Meeting type

### Servicing Interactions

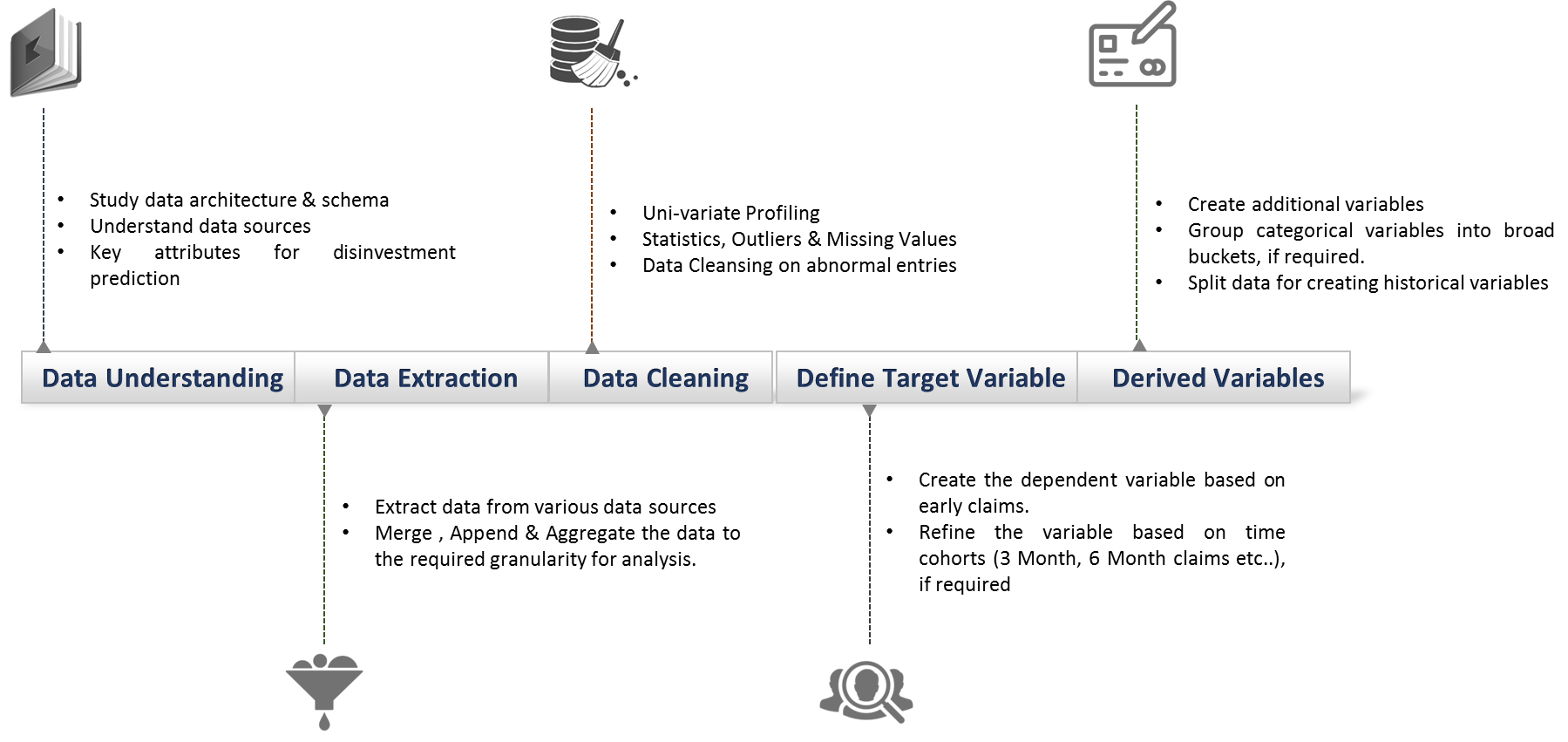
Capture of servicing interaction cases by *category*:

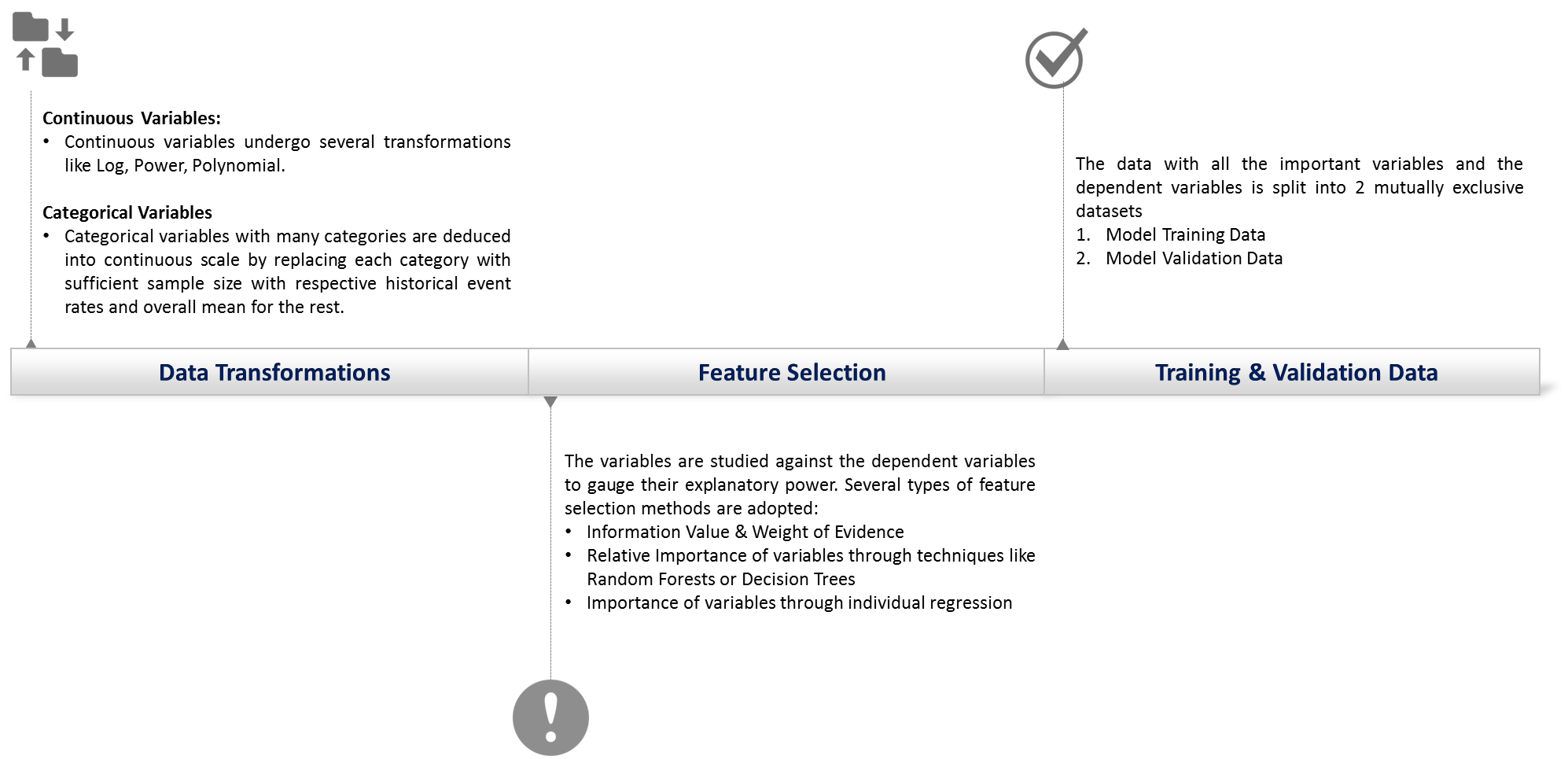
* Valuation cases
* Transaction cases
* Dealing cases
* Audit cases
* Total number of cases raised
* Unresolved cases

Capture of recency of the cases captured by computing the number of days since last cases. Frequency of cases captured by calculating the cases in the last 3, 6, 9 and 12 months.

# Data Profiling and Preparation

The following steps were followed during the data profiling and preparation stage.





## Data Inconsistencies and Treatment

Data issues and inconsistencies were observed and treated in the following way

### Outliers

Scatter plot or univariate of the variables performed to study the distribution and identifying extremely large or small values. Outliers were treated using the following ways

* **Capping/Flooring**
* **Binning** - Split the variables into desired number of bins. Variables were binned based on the frequency distribution and event rate

The below file contains the list of variables and the corresponding bins.



Example: Valuation cases raised in the last 12 months - Even though valuation cases raised in the last 12 months was a discrete variable, the event rate was not linear with increase in valuation cases and it had outliers as well. So, the variable was binned based on the event rate and used in the model.

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Definition** | **Outlier Treatment** |
| Campaigns | Days sine a campaign invite | Capped to 3 years |
| Servicing Interactions | # cases, # dealing cases, # audit cases raised in 3,6,9,12 months | Capped at 4 or 5 years based on event rate |
| Servicing Interactions | Number of days since mandate raised its last case | Capped to 3 years |
| Email | # emails sent, clicks to a mandate in the last 3, 6, 9, 12 months | Capped at 3 or 5 or 6 |
| Email / Meetings | # days since the mandate has opened last email,  # days since attended last meeting | Capped at 3 |
| Transaction Behavior | Time duration between last money inflow / outflow & snapshot start date (in days) | Capped to 3 years |
| Mandate Related | Account type, sub type of the mandate | Except top 6 account types & 14 sub account types, rest were grouped into 'Others' |
| Mandate Related | Client Region | Except top 7 countries, rest were grouped into 'Others' |
| Mandate Related | Fund Code of Major Fund in the mandate (major part of AUM comprised of this fund) | Except top 15 Lead fund, rest were grouped into 'Others' |

### Missing Observations

Missing observations were treated using the following ways

* Variables with missing data greater than 25% were removed from the analysis
* Missing data were replaced by a measure that was representative of the characteristic of the variable e.g. median, minimum
* An indicator/category for missing value was created if there was a significant percentage of missing values and the variable was used as one of the explanatory variables in the model.

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Definition** | **Missing** | **Missing Treatment** |
| Lead Fund Performance | Geometric Relative Returns of the lead fund in last 1, 2, 3, 6, 9 months | 28% | Replaced with median |
| Lead Fund Performance | Geometric Relative Returns of the lead fund in last 1,2,3 years | 28% | Replaced with median |

Consultant Rating - Mandates without consultant rating had high disinvestment rate when compared to mandates with consultant rating and hence the missing values were coded as separate category.

### Data Exclusions

Exclusions were made on the following criteria

* Only Institutional mandates were considered
* Only mandates with AUM > 1 million were considered for analysis
* Mandates of type ‘SL Capital Partners’ were excluded
* Mandates belonging to ‘John Hancock Investments’ and ‘Guardian Assurance’ were excluded because of two reasons
  + Frequent numerous transactions (money inflows and outflows) by these clients which reflect in the AUM on a monthly basis
  + Switches were not being captured correctly

### Data Exploration

* Univariate and Bivariate analysis performed to determine the strength of impact of any variable on disinvestment.
* Cardinality reduction: Reducing the number of levels of a categorical variable to more manageable groups, by grouping relevant categories. Grouping was done be based on
  + Comparing the event rates across categories
  + Similarity of the definitions

Chi-square test, t-test and Information Value (IV) were calculated to assess the predictive power of the variables to be fed into the model.

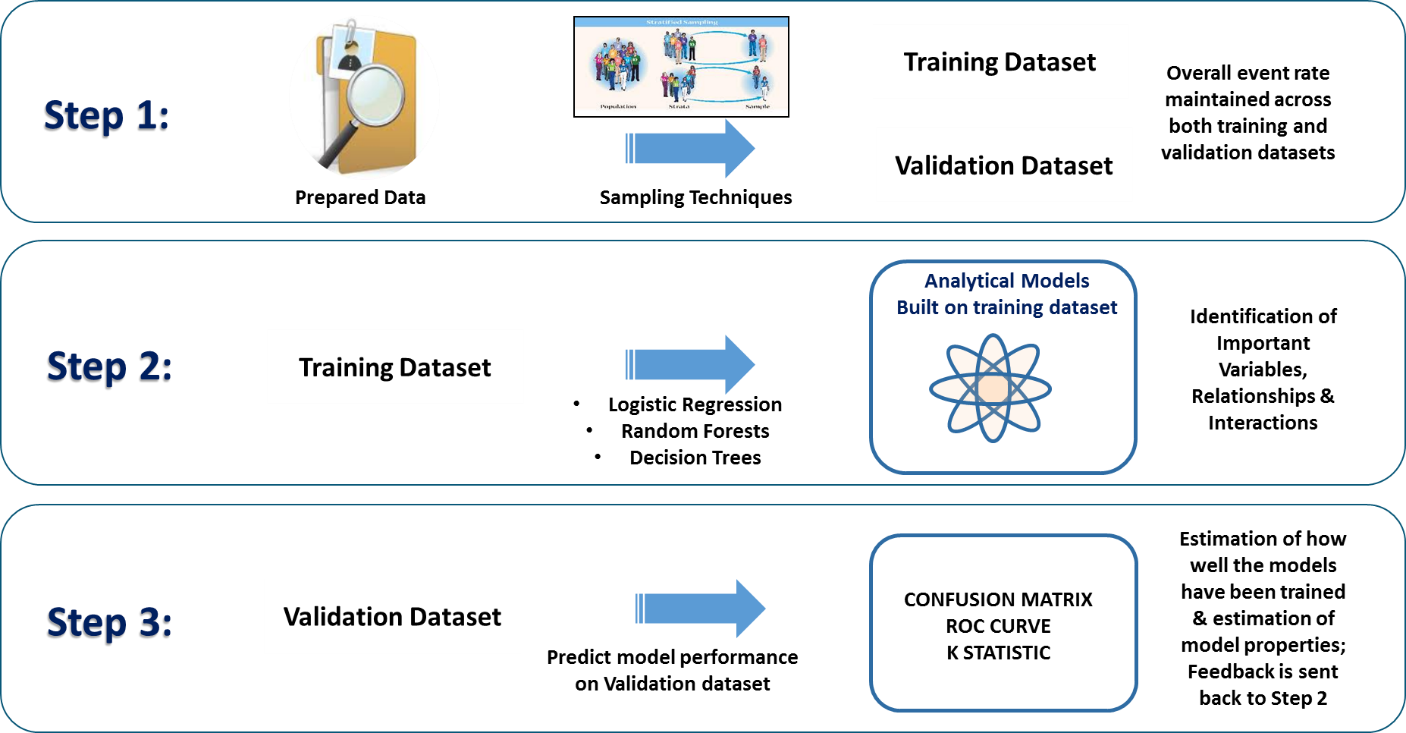
## Sample Data Profiles



# Data Model

Models for estimating the Risk Score for each mandate using disinvestment indicator as the dependent variable (*DV*) and the prepared factors as the independent variables (*IDVs*).

The prepared data was split into training and validation set



**Reasons for Multiple Iterations**

**Baseline Model:**

Consultant Rating and Fund Performance was incomplete. It was available for only 30% of the funds.

The model did not have rolling window time frames as only 1 observation window (Oct 14 – Sep 15) and 1 analysis window (Oct 15 – Sep 16) was possible with the given data.

Iteration 2

* Additional 6 months of data was available. Implementation of Rolling Window (S1 to S7).
* Improved consultant rating and Fund performance data because of which it was identified as significant factors of disinvestment by the model
* ***In-time testing***

Iteration 3

Iteration 4

* ***Out of sample testing***
* Implementation of the feedback received from Client Directors (Work in Progress). Additional variables from transactions, Meetings, Fund Performance and Consultant Ratings to be included in the model. Segregate mandates into DB and DC and treat separately.
* Additional 2 months of data was available which was considered for ***Out of time testing***
* Considered lead fund performance of the mandate as funds composition changed frequently in the model and there is isn’t a proper source for tracking

## Baseline Model

### Analysis Time Period

**Observation Period:** October 2014 to September 2015

**Performance Period:** October 2015 to September 2016

### Model Building

|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Number of Records** | **No. of Disinvestments** | **Event Rate** |
| Train | 1646 | 180 | 10.9% |
| Test | 705 | 77 | 10.9% |

### Model Performance

The precision of the model is **17%**

|  |  |  |
| --- | --- | --- |
|  | Predicted Non-Disinvestment | Predicted Disinvestment |
| Actual non-disinvestment | 410 | 218 |
| Actual disinvestment | 32 | 45 |

AUC - **.667**

**Comparison with Current Risk Rating**

The following table shows results of prediction over test dataset and comparison with the existing Risk Rating by Client Director/Relationship Manager:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Disinvestment** | | **Current risk rating prediction** | | | **Model 1** | | |
| Number | Value | Number | Value | % Of Actual Value | Number | Value | % Of Actual Value |
| 77 | £1.09 bn | 12 | £367 m | 33.6% | 45 | £782 m | 72% |

\*High risk is being considered from Current risk rating

### Significant Features/ Variables

**Top Drivers of Disinvestment**

Some of the top triggers which impacts disinvestment derived from model results and profiling of variables:

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Attribute** | **Metrics** | **Definition** |
| 1 | Redemptions | Percentage of gross redemption | The percentage of gross redemption from the mandate in the previous year |
| 2 | Transaction Behaviour | No of months gross sales | Number of months that there was investment into the mandate in the previous year |
| 3 | Emails | No of Emails sent | Total number of emails sent in the previous year |
| 4 | Emails | Average Email duration | Average duration between emails sent in the previous year |
| 5 | Transaction Behaviour | Money in days | Time period between date of analysis and date of last investment for the mandate |
| 6 | Servicing Interactions | Valuation cases | Number of Valuation cases raised over the last year |
| 7 | Meetings | Sum of Negative event count | Total number of Negative meetings during the last year |
| 8 | Campaign | Last campaign days | Number of days since the mandate received a campaign invite |

## Iteration 2

### Analysis Time Period

Baseline model was extended to seven months in the second phase of engagement. Data was available at the start of second phase for 6 more months. Hence, the model was extended to seven snapshots. These had varying event rates up to 14%. This model was primarily to study the various independent attributes that were contributing to the model.

Thus, we included 7 snapshots of data which were as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Snapshot #** | **Disinvestment Period** | | **No. of Records** | **No. of Disinvestments** | **Event Rate** |
| **From** | **To** |
| 1 | Oct 2015 | Sep 2016 | 1712 | 188 | 11.0% |
| 2 | Nov 2015 | Oct 2016 | 1717 | 187 | 10.9% |
| 3 | Dec 2015 | Nov 2016 | 1734 | 208 | 12.0% |
| 4 | Jan 2016 | Dec 2016 | 1760 | 221 | 12.6% |
| 5 | Feb 2016 | Jan 2017 | 1769 | 228 | 12.9% |
| 6 | Mar 2016 | Feb 2017 | 1791 | 246 | 13.7% |
| 7 | Apr 2016 | Mar 2017 | 1810 | 249 | 13.8% |

The client behaviour observation period was considered prior to the start of disinvestment period. From this phase, the observation period became a rolling window rather than a fixed period and therefore variables formulated had the variations of 3, 6, 9 and 12 months. Only mandates with AUM>1 million were considered for analysis.

### Model Building

The data prepared in the form of 7 snapshots were divided into train and test in the ratio of 80:20.

|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Number of Records** | **No. of Disinvestments** | **Event Rate** |
| Train | 9800 | 1219 | 12.4% |
| Test | 2493 | 308 | 12.4% |

**Techniques Used:**

* Logistic Regression
* Random Forest
* Extreme Gradient Boosting

Extreme Gradient Boosting technique was finalised as the resultant model had a precision of 38% (which is 21% increase in precision from phase 1) which was better than the results of other techniques.

### Model Performance

**Confusion Matrix**

Precision (True Positive/Total Model Prediction) has doubled from **17% to 38%**

|  |  |  |
| --- | --- | --- |
|  | Predicted Non-Disinvestment | Predicted Disinvestment |
| Actual non-disinvestment | 1948 | 237 |
| Actual disinvestment | 162 | 146 |

This model has an AUC of **0.73 and** K-statistics of **0.4.**

**Comparison with Current Risk Rating**

The following table shows results of prediction over test dataset and comparison with the existing Risk Rating by Client Director/Relationship Manager:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Disinvestment** | | **Current risk rating prediction** | | | **Model 2** | | |
| Number | Value | Number | Value | % Of Actual Value | Number | Value | % Of Actual Value |
| 308 | £6.7 bn | 14 | £618 m | 9.2% | 146 | £4.3 bn | 64% |

\*High risk is being considered from Current risk rating

### Significant Features/ Variables

**Top Drivers of Disinvestment**

Some of the top triggers which impacts disinvestment derived from model results and profiling of variables:

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Attribute** | **Metrics** | **Definition** |
| 1 | Campaign | Last campaign days | Number of days since the mandate received a campaign invite |
| 2 | Servicing Interactions | Valuation cases | Number of valuation cases raised by the mandate in the last 12 months |
| 3 | Transaction Behaviour | Last Money In days | Time duration between last money inflow and snapshot start date (in days) |
| 4 | Servicing Interactions | Last Case Days | Number of days since mandate raised its last case |
| 5 | Transaction Behaviour | % Money out in last 12 months | Percentage of money outflow compared to maximum AUM in last 12 months |
| 6 | Servicing Interactions | Average Time Gap between Cases | Average time gap between two consecutive cases in the last 12 months |
| 7 | Consultant Rating | Current Consultant Rating | Mandate level rating based on the fund composition and fund rating given by the external consultants |
| 8 | Transaction Behaviour | Last Money Out Days | Time duration between last money outflow and snapshot start date (in days) |
| 9 | Servicing Interactions | Unresolved Cases | Number of unresolved cases for a mandate in the last 12 months |
| 10 | Performance | Mandate Performance 6 months | Percentage change in mandate AUM in the last 6 months |

## Iteration 3

### Analysis Time Period

*Two more months of data was available in phase 3 of engagement*. Hence, in this phase, in addition to 7 snapshots of data, 2 new snapshots were prepared for validation purposes. So was the model built was rebuilt on 100% of the 7 snapshots of data.

The Disinvestment time periods as follows:

* May 2016 – Apr 2017
* June 2016 – May 2017

*Additional variables* were added based on further data availability and input from client directors.

* Mandate related variables - Age of Mandate, Account Type, Account Subtype
* Client specific variables - Age of Client, Region
* Fund related variables - Lead Fund Name, Lead Fund performance (1 Year, 2 Year, 3 Year)

### Model Building

The first 7 snapshots of data were taken as train set and the 2 new snapshots as test set.

|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Number of Records** | **No. of Disinvestments** | **Event Rate** |
| Train | 13102 | 1750 | 13.4% |
| Test | 3891 | 619 | 15.9% |

**Techniques Used:**

* Logistic Regression
* Decision Trees
* Random Forest
* *Extreme Gradient Boosting (best performing)*

The same ‘xgboost’ technique was used as it showed better precision (60%) and recall compared with the other techniques. And also, some more additional client/mandate specific variables were added into the model.

### Model Performance

**Confusion Matrix**

Model Predicted Vs Not Predicted

* The Precision (True Positive/Total Model Prediction) has increased to **60%.**

|  |  |  |
| --- | --- | --- |
|  | Predicted Non-Disinvestment | Predicted Disinvestment |
| Actual non-disinvestment | 3024 | 248 |
| Actual disinvestment | 244 | 375 |

This model has an AUC of **0.837** andK-Statistics of 0.55

**Comparison with Current Risk Rating**

The following table shows results of prediction over test dataset and comparison with the existing Risk Rating by Client Director/Relationship Manager:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Disinvestment** | | **Current risk rating prediction** | | | **Model 3** | | |
|
| Number | Value | Number | Value | % Of Actual Value | Number | Value | % Of Actual Value |
| 619 | £16.3 bn | 67 | £1.86 bn | 11% | 375 | £8.5 bn | 52% |

\*High risk is being considered from Current risk rating

### Significant Features/ Variables

**Top Drivers of Disinvestment**

Some of the top triggers which impacts disinvestment derived from model results and profiling of variables:

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Attribute** | **Metrics** | **Definition** |
| 1 | Mandate Related | Age of Mandate | Time Duration in which mandate has been funded with SLI (in months) |
| 2 | Campaign | Last campaign days | Number of days since the mandate received a campaign invite |
| 3 | Transaction Behaviour | Last Money In days | Time duration between last money inflow and snapshot start date (in days) |
| 4 | Transaction Behaviour | Last Money Out Days | Time duration between last money outflow and snapshot start date (in days) |
| 5 | Mandate Related | Lead Fund | Fund Code of Major Fund in the mandate (major part of AUM comprised of this fund) |
| 6 | Servicing Interactions | Last Case Days | Number of days since mandate raised its last case |
| 7 | Mandate Related | Account Sub type | Account Sub type of the mandate |
| 8 | Mandate Related | Region | Client Region |
| 9 | Consultant Rating | Current Consultant Rating | Mandate level rating based on the fund composition and fund rating given by the external consultants |
| 10 | Servicing Interactions | Valuation cases | Number of valuation cases raised by the mandate in the last 12 months |
| 11 | Servicing Interactions | Unresolved Cases | Number of unresolved cases for a mandate in the last 12 months |
| 12 | Transaction Behaviour | % Money out in last 12 months | Percentage of money outflow compared to maximum AUM in last 12 months |

## General Comments

The **cut offs** were determined based on the event rates. In this case, the event rate of S8 and S9 snapshots were **16%** which was taken as the cut off. In some cases, the cut offs can also be determined based on the number of false positives that can be accommodated.

The initial iterations were focused on building a better model in terms of statistical indicators of Precision, Recall and AUC score. This meant that the model was at times specifically lead to over fit to derive the significant variables. This is neither the best-case scenario nor the production ready model. The underlying mandates were same across the months even with the IDVs changing significantly over time (up until Iteration 3).

Production ready model has been to mimic the real-world scenario. Also, statistical cut-offs or AUC is not the right measure to determine the success of the model. The following two steps were adopted to improve the usability of the model without compromising on the statistical significance.

1. Out of sample validation in Iteration 4 (explained immediately in the next section)
2. Validation of the results with Client Directors including the variables driving disinvestment.

## Iteration 4

### Analysis Time Period

Analysis time period is same as Iteration 3

### Model Building

Random 15% (300) of the mandates were selected and removed from the development sample (S1 to S7) and test sample (S8 to S9) to test the model performance on new mandates the model had not seen before.

The development sample was further split into train and validation set

|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Number of Records** | **No. of Disinvestments** | **Event Rate** |
| Train | 9177 | 1277 | 13.8% |
| Validation | 1886 | 274 | 14.5% |
| Test | 1936 | 298 | 15.4% |

Extreme Gradient Boosting technique was used to develop the model on the training sample and tested on the validation sample and test sample.

The results of the interim model (Iteration 4 is Work in Progress). It is expected to get improvised further.

### Model Performance

**Confusion Matrix**

Model Predicted Vs Not Predicted

Performance of S8 snapshot without overlap in train set *(on mandates hidden from training set)*

|  |  |  |
| --- | --- | --- |
|  | Predicted Non-Disinvestment | Predicted Disinvestment |
| Actual non-disinvestment | 218 | 26 |
| Actual disinvestment | 29 | 22 |

AUC of the model is **0.693** and K-Statistic 0.36. Precision – 45%

**Comparison with Current Risk Rating (Without Overlap – out of sample mandates)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Disinvestment** | | **Current risk rating prediction** | | | **Model 3** | | |
|
| Number | Value | Number | Value | % Of Actual Value | Number | Value | % Of Actual Value |
| 51 | £1.67 bn | 8 | £0.39 mn | 23.3% | 22 | £0.60 mn | 36% |

\*High risk is being considered from Current risk rating

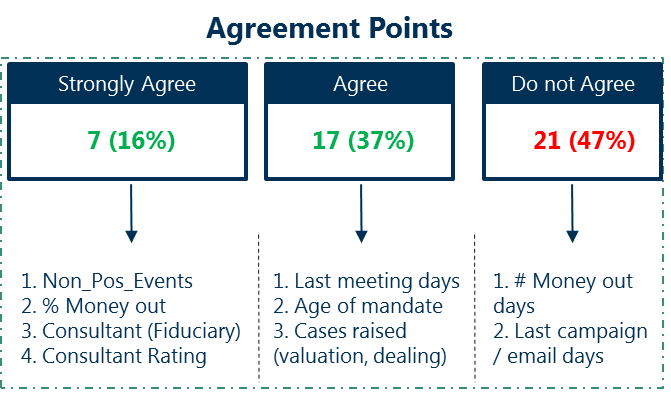
### Significant Features/ Variables

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Attribute** | **Metrics** | **Definition** |
| 1 | Mandate Related | Age of Mandate | Time Duration in which mandate has been funded with SLI (in months) |
| 2 | Transaction Behaviour | % Money out in last 9 months | Percentage of money outflow compared to maximum AUM in last 9 months |
| 3 | Consultant Rating | Current Consultant Rating | Mandate level rating based on the fund composition and fund rating given by the external consultants |
| 4 | Servicing Interactions | Unresolved Cases | Number of unresolved cases for a mandate in the last 12 months |
| 5 | Mandate Related | Mandate Performance 12 months | The percentage change in the mandates worth(AUM) in the last 12 months |
| 6 | Transaction Behaviour | Last Money Out Days | Time duration between last money outflow and snapshot start date (in days) |
| 7 | Servicing Interactions | Valuation cases 12 months | Number of valuation cases raised by the mandate in the last 12 months |
| 8 | Servicing Interactions | Last Case Days | Number of days since mandate raised its last case |
| 9 | Campaign | Last campaign days | Number of days since the mandate received a campaign invite |
| 10 | Mandate Related | Region | Client Region |
| 11 | Transaction Behaviour | Last Money In days | Time duration between last money inflow and snapshot start date (in days) |
| 12 | Mandate Related | Account Sub type | Account Sub type of the mandate |

# Client Directors Interactions

The model results were presented to client directors and based on the feedback from client directors, uplift and agreement percentage were measured in order to measure the accuracy of the model. Their inputs will be incorporated for further model improvements.

Client directors agreed to upgrade risk for **16%** of the mandates (7/45 mandates) predicted (AUM **12%)**. Client Directors agreed with the risk rating for **53%** of mandates (24/45 mandates) predicted (AuM - **50%**). They agreed especially with the factors predicting risk but would still retain the same risk rating as theirs (Medium risk) as the model does not predict medium risk at the moment.



1) **Strongly Agree** – Agreed to upgrade the mandate to high risk

2) **Agree** – Agree with factors predicting investment but still would retain as medium risk since model does not predict medium risk

3) **Do not agree** – Do not agree with either the risk rating or the factors

## Generic Feedback

* DB’s and DC’s should be treated separately. This is because money will be taken out for pensions early in case of DB.
* Currently fund performance compared with the benchmark indices were used as an input to the model. Client directors suggested to use exact fund performance measure along with benchmark indices performance.
* Currently the model prediction is for 2 levels of risk (high risk and low risk). The input from the client directors is to have 3 levels of prediction instead of 2 levels.
* Consultant rating change and last contact instead of last meeting should also be considered as an input.

## Client Directors Breakdown

### Douglas Hogg

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Agreement %** | | |
| **Meeting Tone** | **Mandates** | **AUM at Risk** | **Uplift** | **Agree** | **Do not agree** |
| Positive | 6 | 193.1 M | 17% | 50% | 33% |

* **Qualitative Factors**

The following qualitative factors should be considered for the model

* Consultant Rating
* Last Meeting Days
* % Money Out
* Last Money Out Days
* Cases (Valuation, Dealing)
* **New Variables**

The following variables were to be considered

* Tweak last meeting days indicator based on the AUM amount
* AuM > 75 M – 4 meet/ year
* AuM > 25 & < 75 – 2 / year
* AuM < 25 – 1 meet / year
* Weighted consultant rating can be used with more weights given to the particular account’s consultant
* Add meeting sentiment, as meeting tone is a significant indicator of an accounts strategic perspective on fund performance & consultant rating
* **Questions/Feedback**
* Provide risk based on predicted probability
* Give higher weightage to principal consultant’s rating

### Paul Smyth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Agreement %** | | |
| **Meeting Tone** | **Mandates** | **AUM at Risk** | **Uplift** | **Agree** | **Do not agree** |
| Positive | 14 | 320 M | 21% | 43% | 36% |

* **Qualitative Factors**

The following qualitative factors should be considered for the model

* Consultant Rating
* % Money Out
* Age of Mandate
* Valuation Cases
* **New Variables**

The following variables are to be considered

* Change in consultant rating
* Last contact date instead of last meeting date
* Defined Benefits and Defined Contribution to be refreshed separately
* **Questions/Feedback**
* Verify last meeting days as the model is not picking up the recent data

### Ross Campbell

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Agreement %** | | |
| **Meeting Tone** | **Mandates** | **AUM at Risk** | **Uplift** | **Agree** | **Do not agree** |
| Negative | 3 | 21 M | 0% | 33% | 67% |

* **Qualitative Factors**

The following qualitative factors should be considered for the model

* Consultant Rating
* % Money Out
* **New Variables**

The following variables are to be considered

* Fund Performance Measure
* Revise % money out and set a benchmark for money being gone out
* **Questions/Feedback**
* Data validity check for last meeting days & % money out should be done as it is skewing some results

### Charlie Baillie

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Agreement %** | | |
| **Meeting Tone** | **Mandates** | **AUM at Risk** | **Uplift** | **Agree** | **Do not agree** |
| Neutral | 18 | 229 M | 17% | 28% | 55% |

* **Qualitative Factors**

The following qualitative factors should be considered for the model

* Consultant Rating
* Consultant being fiduciary manager
* **New Variables**

The following variables are to be considered

* Fund Performance Measure
* External data
* **Questions/Feedback**
* Use external data apart from the data provided by the client directors
* Incorporate fund performance measure

### Fraser Macnair

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Agreement %** | | |
| **Meeting Tone** | **Mandates** | **AUM at Risk** | **Uplift** | **Agree** | **Do not agree** |
| Neutral | 4 | 123 M | 0% | 50% | 50% |

* **Qualitative Factors**

The following qualitative factors should be considered for the model

* Meeting Tone (Non-positive events)
* Age of mandate
* **New Variables**

The following variables are to be considered

* Defined Benefits and Defined Contribution indicator
* External data
* **Questions/Feedback**
* Platforms and PPFs to be treated separately

Incorporate fund performance measure (3 yrs. vs 5 yrs.)

## Next Steps

### Modelling

* Trying out transformations where there is scope to increase significance of certain variables
* Text mining of meeting notes, case notes. The interactions with the clients during the meetings are captured in the meeting notes. Text analytics on the meeting notes could possibly generate new additional variables that may act as significant factors of disinvestment.

### Data

* Investment Datamart (risk matrix, predicted future cash flow for each of the funds)
* Fund outlook based on external research papers (KPMG, LDI etc.)

### Socializing

* Run the improved model with selected client directors again
* Socialize with all client directors for SLI heritage funds
* Build an interface by which client directors can use the results of the model or integration with salesforce

# Appendix

## Model Variables

Baseline Model: The list of metrics used to build the model:



Phase 2: The list of metrics used to build the model:



Phase 3: The list of metrics used to build the model:



## Model Source Code



## Sample Data Profile Across Snapshots

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| V1 - AUM at Time | V2 - # Cases Raised in 6m | V3 - # Cases Raised in 12m | V4 - # Valuation Cases Raised in 6m | V5 - # Valuation Cases Raised in 12m |
| V6 - # Dealing Cases Raised in 6m | V7 - # Dealing Cases Raised in 12m | V8 - # Unresolved Cases | V9 - Consultant Rating | V10 - % Money In 6m |
| V11 - % Money In 12m | V12 - % Money Out 6m | V13 - % Money Out 12m | V14 - Fund Performance YTD | V15 - Fund Performance 3 Months |
| V16 - Fund Performance 6 Months | V17 - Fund Performance 1 Year | V18 - Fund Performance 3 Years | V19 - Latest Meeting Tone | V20 - Non-Positive Events 6m |

Mandate Name:Ins-IRLI104589-Flextronics International Cork B.V. Retirement and Death Benefit

Account Name: Flextronics International Cork B.V.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 1.04 M | 13 | 21 | 2 | 2 | 6 | 13 | 0 | 1 | 1.44 | 3.64 | -0.14 | -0.14 | 2.00 | -1.70 | -2.46 | 3.10 | 17.27 | NA | 0 |
| **S2** | 1.02 M | 12 | 21 | 2 | 2 | 7 | 14 | 1 | 1 | 1.46 | 3.63 | -0.14 | -0.14 | 4.36 | -0.35 | -0.07 | 5.98 | 19.73 | NA | 0 |
| **S3** | 1.02 M | 14 | 22 | 2 | 2 | 9 | 15 | 2 | 1 | 2.53 | 4.21 | -0.14 | -0.14 | 4.77 | 1.66 | -0.45 | 4.67 | 19.94 | NA | 0 |
| **S4** | 1.07 M | 13 | 22 | 2 | 2 | 8 | 15 | 2 | 1 | 2.52 | 4.16 | 0 | -0.14 | 3.84 | 1.81 | 0.07 | 3.84 | 17.70 | NA | 0 |
| **S5** | 1.09 M | 11 | 22 | 1 | 2 | 9 | 15 | 2 | 1 | 2.88 | 4.47 | 0 | -0.13 | -1.78 | -2.27 | -2.61 | -0.42 | 14.93 | NA | 0 |
| **S6** | 1.10 M | 12 | 23 | 1 | 2 | 9 | 15 | 2 | 1 | 2.95 | 4.29 | 0 | -0.13 | -2.68 | -3.54 | -1.94 | -3.02 | 12.54 | NA | 0 |
| **S7** | 1.13 M | 10 | 23 | 0 | 2 | 8 | 14 | 2 | 0 | 2.98 | 4.31 | 0 | -0.13 | -3.10 | -3.10 | -1.35 | -3.77 | 10.28 | NA | 0 |

Mandate Name:Seg-36-The Standard Life Staff Pension Scheme

Account Name: Standard Life Employee Services Limited

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 4.10 B | 39 | 6  7 | 0 | 0 | 35 | 59 | 0 | 0.01 | 4.81 | 7.29 | -6.19 | -7.75 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S2** | 4.05 B | 36 | 66 | 0 | 0 | 32 | 58 | 0 | 0.01 | 4.72 | 7.17 | -5.88 | -7.74 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S3** | 4.14 B | 37 | 66 | 0 | 0 | 33 | 58 | 2 | 0.01 | 3.92 | 7.14 | -5.96 | -7.95 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 1 |
| **S4** | 3.97 B | 40 | 70 | 0 | 0 | 36 | 62 | 2 | 0.01 | 1.44 | 5.93 | -2.76 | -7.56 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 1 |
| **S5** | 4.20 B | 35 | 71 | 0 | 0 | 33 | 63 | 2 | 0.01 | 2.29 | 6.89 | -2.88 | -7.92 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 1 |
| **S6** | 4.20 B | 33 | 70 | 0 | 0 | 30 | 61 | 3 | 0.01 | 2.87 | 6.7 | -2.93 | -7.81 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 1 |
| **S7** | 4.19 B | 36 | 75 | 0 | 0 | 33 | 68 | 4 | 0.00 | 2.06 | 6.85 | -2.26 | -8.43 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 1 |

Mandate Name:Ins-GBRL102887-CAT - UK SERVICES LIMITED PENSION FUND

Account Name: CAT UK

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 9.88 M | 3 | 4 | 0 | 0 | 2 | 2 | 2 | 0.00 | 0 | 0 | -1.31 | -1.30 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S2** | 10.09 M | 2 | 4 | 0 | 0 | 2 | 2 | 2 | 0.00 | 0 | 0 | -1.35 | -1.30 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S3** | 10.55 M | 3 | 5 | 0 | 0 | 3 | 3 | 2 | 0.00 | 0 | 0 | -1.3 | -1.30 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S4** | 10.04 M | 4 | 6 | 0 | 0 | 4 | 4 | 2 | 0.00 | 0 | 0 | -1.91 | -1.90 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S5** | 10.19 M | 4 | 5 | 0 | 0 | 4 | 4 | 1 | 0.00 | 0 | 0 | -1.91 | -1.91 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S6** | 10.50 M | 4 | 7 | 0 | 0 | 3 | 5 | 1 | 0.00 | 0 | 0 | -1.91 | -1.91 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S7** | 10.67 M | 4 | 7 | 0 | 0 | 3 | 5 | 1 | 0.00 | 0 | 0 | -1.5 | -2.80 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |

Mandate Name:Ins-GBRT103131-THE DANCERS PENSION SCHEME

Account Name: Dancers Pension Trustees Limited

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 9.85 M | 33 | 38 | 16 | 16 | 3 | 6 | 1 | 1.00 | 2.08 | 6.66 | 0 | 0.00 | 1.28 | -1.86 | -3.01 | 2.47 | 15.92 | 0 | 0 |
| **S2** | 10.11 M | 36 | 42 | 18 | 18 | 6 | 8 | 1 | 1.00 | 2.39 | 6.9 | 0 | 0.00 | 3.71 | -0.45 | 0.01 | 5.21 | 18.45 | 0 | 0 |
| **S3** | 10.15 M | 37 | 44 | 19 | 19 | 7 | 7 | 1 | 1.00 | 2.68 | 2.68 | 0 | 0.00 | 3.97 | 1.38 | -0.6 | 3.71 | 18.40 | 0 | 0 |
| **S4** | 12.14 M | 43 | 56 | 21 | 21 | 15 | 16 | 1 | 1.00 | 19.2 | 19.2 | -0.06 | -0.07 | 3.01 | 1.70 | -0.19 | 3.01 | 16.51 | 0 | 0 |
| **S5** | 11.85 M | 48 | 65 | 22 | 22 | 19 | 20 | 2 | 1.00 | 19.2 | 19.2 | -0.13 | -0.13 | -2.11 | -2.77 | -3.21 | -1.20 | 12.66 | 0 | 0 |
| **S6** | 11.73 M | 38 | 71 | 10 | 25 | 20 | 22 | 2 | 1.00 | 18.58 | 19.47 | -0.24 | -0.24 | -2.83 | -3.72 | -2.4 | -3.80 | 10.53 | 0 | 0 |
| **S7** | 11.76 M | 40 | 73 | 10 | 26 | 19 | 22 | 2 | 0.00 | 17.97 | 19.68 | -0.34 | -0.34 | -3.29 | -3.29 | -1.64 | -4.60 | 8.60 | 0 | 0 |

Mandate Name:Seg-2238-Allianz ALIK SLI Corporates

Account Name: Allianz Investment Management

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 1.07 B | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | #N/A | 0 |
| **S2** | 1.05 B | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | #N/A | 0 |
| **S3** | 1.04 B | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | #N/A | 0 |
| **S4** | 1.08 B | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | #N/A | 0 |
| **S5** | 1.13 B | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | #N/A | 0 |
| **S6** | 1.26 B | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0.00 | 8.02 | 8.02 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | #N/A | 0 |
| **S7** | 1.30 B | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0.00 | 7.77 | 7.77 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |

Mandate Name:Seg-2300-Fonds de Reserve Pour les Retraites (FRR)

Account Name: Fonds de Reserve pour les Retraites (FRR)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 832.96 M | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S2** | 821.23 M | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S3** | 811.46 M | 3 | 3 | 0 | 0 | 0 | 0 | 1 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S4** | 844.86 M | 3 | 3 | 0 | 0 | 0 | 0 | 1 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S5** | 878.14 M | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 0.00 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S6** | 782.76 M | 3 | 4 | 0 | 0 | 1 | 1 | 1 | 0.00 | 0 | 0 | -13.28 | -13.28 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S7** | 807.75 M | 2 | 4 | 0 | 0 | 1 | 1 | 1 | 0.00 | 0 | 0 | -13.28 | -13.28 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |

Mandate Name:Seg-Z75J-Swiss Federal Pension Fund PUBLICA

Account Name: Swiss Federal Pension Fund PUBLICA (Global HQ)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** |  | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 933.44 M | 7 | 17 |  | 0 | 0 | 7 | 13 | 1 | 0.00 | 7.59 | 7.49 | -0.11 | -0.18 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S2** | 920.18 M | 6 | 14 |  | 0 | 0 | 6 | 11 | 1 | 0.00 | 7.59 | 7.49 | -0.08 | -0.18 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S3** | 908.48 M | 7 | 16 |  | 0 | 0 | 7 | 13 | 2 | 0.00 | 7.59 | 7.59 | -0.06 | -0.18 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S4** | 944.36 M | 7 | 16 |  | 0 | 0 | 7 | 13 | 2 | 0.00 | 3.75 | 7.5 | -0.09 | -0.20 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S5** | 966.97 M | 9 | 16 |  | 0 | 0 | 9 | 15 | 1 | 0.00 | 0 | 7.33 | -1.65 | -1.74 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S6** | 996.93 M | 11 | 17 |  | 0 | 0 | 11 | 17 | 1 | 0.00 | 0 | 7.11 | -1.63 | -1.72 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |
| **S7** | 1032.22 M | 10 | 17 |  | 0 | 0 | 10 | 17 | 1 | 0.00 | 0 | 6.86 | -1.55 | -1.66 | 0.00 | 0.00 | 0 | 0.00 | 0.00 | 0 | 0 |

Mandate Name:OEIC/UT-IFDS212442-Peace of Mind Funeral Trust 2005

Account Name: Dignity PLC

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| **S1** | 10.00 M | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.25 | 99.29 | 99.29 | 0 | 0.00 | 1.07 | -1.86 | -3.24 | 2.27 | 15.26 | 0 | 0 |
| **S2** | 10.24 M | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.25 | 99.29 | 99.29 | 0 | 0.00 | 3.51 | -0.45 | -0.21 | 5.02 | 17.80 | 0 | 0 |
| **S3** | 10.27 M | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.25 | 99.29 | 99.29 | 0 | 0.00 | 3.77 | 1.39 | -0.82 | 3.51 | 17.75 | 0 | 0 |
| **S4** | 10.17 M | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.21 | 0 | 99.29 | 0 | 0.00 | 2.81 | 1.72 | -0.18 | 2.81 | 15.85 | 0 | 0 |
| **S5** | 9.96 M | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.21 | 0 | 99.29 | 0 | 0.00 | -2.11 | -2.78 | -3.22 | -1.41 | 12.01 | 0 | 0 |
| **S6** | 9.88 M | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.28 | 0 | 99.29 | 0 | 0.00 | -2.84 | -3.74 | -2.4 | -4.02 | 9.87 | 0 | 0 |
| **S7** | 9.84 M | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 99.29 | 0 | 0.00 | -3.30 | -3.30 | -1.63 | -4.83 | 7.95 | 0 | 0 |

Mandate Name:Ins-IRLI105069-Laboratory Supplies Limited Defined Contribution Plan

Account Name: Willis Passive and Active Lifestyle Solutions

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| S1 | 1.03 M | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0.60 | 99.12 | 99.12 | 0 | 0.00 | -1.14 | -3.60 | -4.99 | -0.63 | 0.00 | 0 | 0 |
| S2 | 1.03 M | 3 | 3 | 0 | 0 | 3 | 3 | 1 | 0.59 | 99.5 | 99.5 | 0 | 0.00 | 2.07 | -1.76 | -1.07 | 3.66 | 0.00 | 0 | 0 |
| S3 | 1.02 M | 4 | 4 | 0 | 0 | 4 | 4 | 1 | 0.58 | 99.91 | 99.91 | 0 | 0.00 | 2.30 | 1.72 | -1.93 | 1.51 | 0.00 | 0 | 0 |
| S4 | 1.06 M | 7 | 7 | 0 | 0 | 7 | 7 | 1 | 0.57 | 97.25 | 97.25 | 0 | -0.01 | 1.18 | 2.34 | -1.34 | 1.18 | 0.00 | 0 | 0 |
| S5 | 1.10 M | 8 | 8 | 0 | 0 | 8 | 8 | 1 | 0.56 | 95.65 | 95.65 | 0 | 0.00 | -2.45 | -3.31 | -5.01 | -3.77 | 0.00 | 0 | 0 |
| S6 | 1.11 M | 10 | 10 | 1 | 1 | 9 | 9 | 1 | 0.59 | 95.38 | 95.38 | 0 | 0.00 | -4.47 | -5.52 | -3.89 | -6.78 | 0.00 | 0 | 0 |
| S7 | 1.21 M | 8 | 10 | 1 | 1 | 7 | 9 | 1 | 0.00 | 8.62 | 93.28 | -0.01 | -0.01 | -4.21 | -4.21 | -1.96 | -6.86 | 0.00 | 0 | 0 |

Mandate Name:Ins-GBRT104278-The Grace UK Pension Plan

Account Name: Grace UK

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Snapshot** | **V1** | **V2** | **V3** | **V4** | **V5** | **V6** | **V7** | **V8** | **V9** | **V10** | **V11** | **V12** | **V13** | **V14** | **V15** | **V16** | **V17** | **V18** | **V19** | **V20** |
| S1 | 9.95 M | 22 | 46 | 7 | 14 | 8 | 15 | 4 | 0.53 | 0 | 0 | -1 | -2.76 | 1.28 | -1.86 | -3.01 | 2.47 | 15.92 | #N/A | 0 |
| S2 | 8.34 M | 28 | 54 | 9 | 16 | 12 | 19 | 4 | 0.52 | 0 | 0 | -18.25 | -19.92 | 3.71 | -0.45 | 0.01 | 5.21 | 18.45 | #N/A | 0 |
| S3 | 8.35 M | 31 | 56 | 9 | 16 | 12 | 18 | 4 | 0.53 | 0 | 0 | -18.02 | -19.60 | 3.97 | 1.38 | -0.6 | 3.71 | 18.40 | #N/A | 0 |
| S4 | 8.23 M | 31 | 55 | 10 | 17 | 12 | 17 | 4 | 0.44 | 0 | 0 | -18.47 | -19.72 | 3.01 | 1.70 | -0.19 | 3.01 | 16.51 | #N/A | 0 |
| S5 | 8.04 M | 31 | 52 | 11 | 18 | 11 | 16 | 4 | 0.44 | 0 | 0 | -18.7 | -19.71 | -2.11 | -2.77 | -3.21 | -1.20 | 12.66 | #N/A | 0 |
| S6 | 7.94 M | 34 | 53 | 11 | 17 | 10 | 16 | 4 | 0.54 | 0 | 0 | -18.86 | -19.61 | -2.83 | -3.72 | -2.4 | -3.80 | 10.53 | #N/A | 0 |
| S7 | 7.96 M | 29 | 52 | 10 | 17 | 5 | 14 | 4 | 0.00 | 0 | 0 | -22.48 | -19.10 | -3.29 | -3.29 | -1.64 | -4.60 | 8.60 | #N/A | 0 |

## Data Sourcing Queries

### Number of Transactions:

SELECT

[Mandate ID], SUM(NO\_OF\_MONEY\_IN\_3m) NO\_OF\_MONEY\_IN\_3m,

SUM(NO\_OF\_MONEY\_IN\_6m) NO\_OF\_MONEY\_IN\_6m,

SUM(NO\_OF\_MONEY\_IN\_9m) NO\_OF\_MONEY\_IN\_9m,

SUM(NO\_OF\_MONEY\_IN\_12m) NO\_OF\_MONEY\_IN\_12m,

SUM(NO\_OF\_MONEY\_OUT\_3m) NO\_OF\_MONEY\_OUT\_3m,

SUM(NO\_OF\_MONEY\_OUT\_6m) NO\_OF\_MONEY\_OUT\_6m,

SUM(NO\_OF\_MONEY\_OUT\_9m) NO\_OF\_MONEY\_OUT\_9m,

SUM(NO\_OF\_MONEY\_OUT\_12m) NO\_OF\_MONEY\_OUT\_12m,

SUM(NO\_OF\_SWITCH\_IN\_3m) NO\_OF\_SWITCH\_IN\_3m,

SUM(NO\_OF\_SWITCH\_IN\_6m) NO\_OF\_SWITCH\_IN\_6m,

SUM(NO\_OF\_SWITCH\_IN\_9m) NO\_OF\_SWITCH\_IN\_9m,

SUM(NO\_OF\_SWITCH\_IN\_12m) NO\_OF\_SWITCH\_IN\_12m,

SUM(NO\_OF\_SWITCH\_OUT\_3m) NO\_OF\_SWITCH\_OUT\_3m,

SUM(NO\_OF\_SWITCH\_OUT\_6m) NO\_OF\_SWITCH\_OUT\_6m,

SUM(NO\_OF\_SWITCH\_OUT\_9m) NO\_OF\_SWITCH\_OUT\_9m,

SUM(NO\_OF\_TRANSFER\_IN\_3m) NO\_OF\_TRANSFER\_IN\_3m,

SUM(NO\_OF\_TRANSFER\_IN\_6m) NO\_OF\_TRANSFER\_IN\_6m,

SUM(NO\_OF\_TRANSFER\_IN\_9m) NO\_OF\_TRANSFER\_IN\_9m,

SUM(NO\_OF\_TRANSFER\_IN\_12m) NO\_OF\_TRANSFER\_IN\_12m,

SUM(NO\_OF\_TRANSFER\_OUT\_3m) NO\_OF\_TRANSFER\_OUT\_3m,

SUM(NO\_OF\_TRANSFER\_OUT\_6m) NO\_OF\_TRANSFER\_OUT\_6m,

SUM(NO\_OF\_TRANSFER\_OUT\_9m) NO\_OF\_TRANSFER\_OUT\_9m,

SUM(NO\_OF\_TRANSFER\_OUT\_12m) NO\_OF\_TRANSFER\_OUT\_12m

FROM (

select DISTINCT [Mandate ID],

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_IN\_3m,

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_IN\_6m,

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_IN\_9m,

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_IN\_12m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_OUT\_3m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_OUT\_6m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_OUT\_9m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Nbr Of Movements]) END AS NO\_OF\_MONEY\_OUT\_12m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_IN\_3m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_IN\_6m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_IN\_9m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_IN\_12m ,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_OUT\_3m,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_OUT\_6m,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_OUT\_9m,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Nbr Of Movements]) END AS NO\_OF\_SWITCH\_OUT\_12m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_IN\_3m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_IN\_6m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_IN\_9m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_IN\_12m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_OUT\_3m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_OUT\_6m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_OUT\_9m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Nbr Of Movements]) END AS NO\_OF\_TRANSFER\_OUT\_12m

from (select [Mandate ID],

[Movement Type],

---- Added date parameters

CASE WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-3,'2015-10-01')) AND '2015-09-30') then 'Q4'

WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-6,'2015-10-01')) AND (dateadd(month,-3,'2015-10-01'))) then 'Q3'

WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-9,'2015-10-01')) AND (dateadd(month,-6,'2015-10-01'))) then 'Q2'

WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-12,'2015-10-01')) AND (dateadd(month,-9,'2015-10-01'))) then 'Q1' END AS QUARTER\_FROM\_OBS\_DT,

[Nbr Of Movements],[Movement Amount GBP]

FROM [Latentview].[CORP\CO57430].[Movement\_set2] where [Movement Cal Date] BETWEEN (dateadd(month,-12,'2015-10-01')) AND '2015-09-30') x) A

GROUP BY [Mandate ID] ;

### Percentage of Transactions

SELECT [Mandate ID],

--- percentage is calculated by taking sum of transaction amount divided by maximum aum for the timpre period.

case when MONEY\_IN\_3m=0 OR MONEY\_IN\_3m IS NULL OR MAX\_AUM\_3M=0 THEN 0 ELSE (MONEY\_IN\_3m/MAX\_AUM\_3M)\*100 end as PERCENT\_MONEY\_IN\_3M

,case when MONEY\_IN\_6m=0 OR MONEY\_IN\_6m IS NULL OR MAX\_AUM\_6M=0 THEN 0 ELSE (MONEY\_IN\_6m/MAX\_AUM\_6M)\*100 end as PERCENT\_MONEY\_IN\_6M

,CASE WHEN MONEY\_IN\_9m=0 or MONEY\_IN\_9m is null or MAX\_AUM\_9M=0 then 0 else (MONEY\_IN\_9m/MAX\_AUM\_9M)\*100 end as PERCENT\_MONEY\_IN\_9M

,CASE WHEN MONEY\_IN\_12m=0 or MONEY\_IN\_12m is null or MAX\_AUM\_12M=0 then 0 else (MONEY\_IN\_12m/MAX\_AUM\_12M)\*100 end as PERCENT\_MONEY\_IN\_12M

,CASE WHEN MONEY\_OUT\_3m=0 or MONEY\_OUT\_3m is null or MAX\_AUM\_3M=0 then 0 else (MONEY\_OUT\_3m/MAX\_AUM\_3M)\*100 end as PERCENT\_MONEY\_OUT\_3M

,CASE WHEN MONEY\_OUT\_6m=0 or MONEY\_OUT\_6m is null or MAX\_AUM\_6M =0 then 0 else (MONEY\_OUT\_6m/MAX\_AUM\_6M)\*100 end as PERCENT\_MONEY\_OUT\_6M

,CASE WHEN MONEY\_OUT\_9m=0 or MONEY\_OUT\_9m is null or MAX\_AUM\_9M=0 then 0 else (MONEY\_OUT\_9m/MAX\_AUM\_9M)\*100 end as PERCENT\_MONEY\_OUT\_9M

,CASE WHEN MONEY\_OUT\_12m=0 or MONEY\_OUT\_12m is null or MAX\_AUM\_12M=0 then 0 else (MONEY\_OUT\_12m/MAX\_AUM\_12M)\*100 end as PERCENT\_MONEY\_OUT\_12M

,CASE WHEN SWITCH\_IN\_3m=0 or SWITCH\_IN\_3m is null or MAX\_AUM\_3M=0 then 0 else (SWITCH\_IN\_3m/MAX\_AUM\_3M)\*100 end as PERCENT\_SWITCH\_IN\_3M

,CASE WHEN SWITCH\_IN\_6m=0 or SWITCH\_IN\_6m is null or MAX\_AUM\_6M=0 then 0 else (SWITCH\_IN\_6m/MAX\_AUM\_6M)\*100 end as PERCENT\_SWITCH\_IN\_6M

,CASE WHEN SWITCH\_IN\_9m=0 or SWITCH\_IN\_9m is null or MAX\_AUM\_9M=0 then 0 else (SWITCH\_IN\_9m/MAX\_AUM\_9M)\*100 end as PERCENT\_SWITCH\_IN\_9M

,CASE WHEN SWITCH\_IN\_12m=0 or SWITCH\_IN\_12m is null or MAX\_AUM\_12M=0 then 0 else (SWITCH\_IN\_12m/MAX\_AUM\_12M)\*100 end as PERCENT\_SWITCH\_IN\_12M

,CASE WHEN SWITCH\_OUT\_3M=0 or SWITCH\_OUT\_3M is null or MAX\_AUM\_3M=0 then 0 else (SWITCH\_OUT\_3M/MAX\_AUM\_3M)\*100 end as PERCENT\_SWITCH\_OUT\_3M

,CASE WHEN SWITCH\_OUT\_6M=0 or SWITCH\_OUT\_6M is null or MAX\_AUM\_6M=0 then 0 else (SWITCH\_OUT\_6M/MAX\_AUM\_6M)\*100 end as PERCENT\_SWITCH\_OUT\_6M

,CASE WHEN SWITCH\_OUT\_9M=0 or SWITCH\_OUT\_9M is null or MAX\_AUM\_9M=0 then 0 else (SWITCH\_OUT\_9M/MAX\_AUM\_9M)\*100 end as PERCENT\_SWITCH\_OUT\_9M

,CASE WHEN SWITCH\_OUT\_12M=0 or SWITCH\_OUT\_12M is null or MAX\_AUM\_12M=0 then 0 else (SWITCH\_OUT\_12M/MAX\_AUM\_12M)\*100 end as PERCENT\_SWITCH\_OUT\_12M

,CASE WHEN TRANSFER\_IN\_3m=0 or TRANSFER\_IN\_3m is null or MAX\_AUM\_3M=0 then 0 else (TRANSFER\_IN\_3m/MAX\_AUM\_3M)\*100 end as PERCENT\_TRANSFER\_IN\_3M

,CASE WHEN TRANSFER\_IN\_6m=0 or TRANSFER\_IN\_6m is null or MAX\_AUM\_6M=0 then 0 else (TRANSFER\_IN\_6m/MAX\_AUM\_6M)\*100 end as PERCENT\_TRANSFER\_IN\_6M

,CASE WHEN TRANSFER\_IN\_9m=0 or TRANSFER\_IN\_9m is null or MAX\_AUM\_9M=0 then 0 else (TRANSFER\_IN\_9m/MAX\_AUM\_9M)\*100 end as PERCENT\_TRANSFER\_IN\_9M

,CASE WHEN TRANSFER\_IN\_12m=0 or TRANSFER\_IN\_12m is null or MAX\_AUM\_12M=0 then 0 else (TRANSFER\_IN\_12m/MAX\_AUM\_12M)\*100 end as PERCENT\_TRANSFER\_IN\_12M

,CASE WHEN TRANSFER\_OUT\_3m=0 or TRANSFER\_OUT\_3m is null or MAX\_AUM\_3M=0 then 0 else (TRANSFER\_OUT\_3m/MAX\_AUM\_3M)\*100 end as PERCENT\_TRANSFER\_OUT\_3M

,CASE WHEN TRANSFER\_OUT\_6m=0 or TRANSFER\_OUT\_6m is null or MAX\_AUM\_6M=0 then 0 else (TRANSFER\_OUT\_6m/MAX\_AUM\_6M)\*100 end as PERCENT\_TRANSFER\_OUT\_6M

,CASE WHEN TRANSFER\_OUT\_9m=0 or TRANSFER\_OUT\_9m is null or MAX\_AUM\_9M=0 then 0 else (TRANSFER\_OUT\_9m/MAX\_AUM\_9M)\*100 end as PERCENT\_TRANSFER\_OUT\_9M

,CASE WHEN TRANSFER\_OUT\_12m=0 or TRANSFER\_OUT\_12m is null or MAX\_AUM\_12M=0 then 0 else(TRANSFER\_OUT\_12m/MAX\_AUM\_12M)\*100 end as PERCENT\_TRANSFER\_OUT\_12M

FROM (SELECT

[Mandate ID],

COALESCE(SUM( MONEY\_IN\_3m),0) MONEY\_IN\_3m,

COALESCE(SUM( MONEY\_IN\_6m),0) MONEY\_IN\_6m,

COALESCE(SUM( MONEY\_IN\_9m),0) MONEY\_IN\_9m,

COALESCE(SUM( MONEY\_IN\_12m),0) MONEY\_IN\_12m,

COALESCE(SUM( MONEY\_OUT\_3m),0) MONEY\_OUT\_3m,

COALESCE(SUM( MONEY\_OUT\_6m),0) MONEY\_OUT\_6m,

COALESCE(SUM( MONEY\_OUT\_9m),0) MONEY\_OUT\_9m,

COALESCE(SUM( MONEY\_OUT\_12m),0) MONEY\_OUT\_12m,

COALESCE(SUM( SWITCH\_IN\_3m),0) SWITCH\_IN\_3m,

COALESCE(SUM( SWITCH\_IN\_6m),0) SWITCH\_IN\_6m,

COALESCE(SUM( SWITCH\_IN\_9m),0) SWITCH\_IN\_9m,

COALESCE(SUM( SWITCH\_IN\_12m),0) SWITCH\_IN\_12m,

COALESCE(SUM( SWITCH\_OUT\_3m),0) SWITCH\_OUT\_3m,

COALESCE(SUM( SWITCH\_OUT\_6m),0) SWITCH\_OUT\_6m,

COALESCE(SUM( SWITCH\_OUT\_9m),0) SWITCH\_OUT\_9m,

COALESCE(SUM( SWITCH\_OUT\_12m),0) SWITCH\_OUT\_12m,

COALESCE(SUM( TRANSFER\_IN\_3m),0) TRANSFER\_IN\_3m,

COALESCE(SUM( TRANSFER\_IN\_6m),0) TRANSFER\_IN\_6m,

COALESCE(SUM( TRANSFER\_IN\_9m),0) TRANSFER\_IN\_9m,

COALESCE(SUM( TRANSFER\_IN\_12m),0) TRANSFER\_IN\_12m,

COALESCE(SUM( TRANSFER\_OUT\_3m),0) TRANSFER\_OUT\_3m,

COALESCE(SUM( TRANSFER\_OUT\_6m),0) TRANSFER\_OUT\_6m,

COALESCE(SUM( TRANSFER\_OUT\_9m),0) TRANSFER\_OUT\_9m,

COALESCE(SUM( TRANSFER\_OUT\_12m),0) TRANSFER\_OUT\_12m

FROM (

select DISTINCT [Mandate ID],

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Movement Amount GBP]) END AS MONEY\_IN\_3m,

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Movement Amount GBP]) END AS MONEY\_IN\_6m,

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Movement Amount GBP]) END AS MONEY\_IN\_9m,

case when ([Movement Type]='Money In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Movement Amount GBP]) END AS MONEY\_IN\_12m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Movement Amount GBP]) END AS MONEY\_OUT\_3m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Movement Amount GBP]) END AS MONEY\_OUT\_6m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Movement Amount GBP]) END AS MONEY\_OUT\_9m,

case when ([Movement Type]='Money Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Movement Amount GBP]) END AS MONEY\_OUT\_12m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Movement Amount GBP]) END AS SWITCH\_IN\_3m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Movement Amount GBP]) END AS SWITCH\_IN\_6m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Movement Amount GBP]) END AS SWITCH\_IN\_9m,

case when ([Movement Type]='Switch In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Movement Amount GBP]) END AS SWITCH\_IN\_12m ,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Movement Amount GBP]) END AS SWITCH\_OUT\_3m,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Movement Amount GBP]) END AS SWITCH\_OUT\_6m,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Movement Amount GBP]) END AS SWITCH\_OUT\_9m,

case when ([Movement Type]='Switch Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Movement Amount GBP]) END AS SWITCH\_OUT\_12m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Movement Amount GBP]) END AS TRANSFER\_IN\_3m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Movement Amount GBP]) END AS TRANSFER\_IN\_6m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Movement Amount GBP]) END AS TRANSFER\_IN\_9m,

case when ([Movement Type]='Transfer In' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Movement Amount GBP]) END AS TRANSFER\_IN\_12m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT='Q4') THEN ([Movement Amount GBP]) END AS TRANSFER\_OUT\_3m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3')) THEN ([Movement Amount GBP]) END AS TRANSFER\_OUT\_6m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2')) THEN ([Movement Amount GBP]) END AS TRANSFER\_OUT\_9m,

case when ([Movement Type]='Transfer Out' and QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1')) THEN ([Movement Amount GBP]) END AS TRANSFER\_OUT\_12m

from (select [Mandate ID],

[Movement Type],

CASE WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-3,'2016-04-01')) AND '2016-03-31') then 'Q4'

WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-6,'2016-04-01')) AND (dateadd(month,-3,'2016-04-01'))) then 'Q3'

WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-9,'2016-04-01')) AND (dateadd(month,-6,'2016-04-01'))) then 'Q2'

WHEN ([Movement Cal Date] BETWEEN (dateadd(month,-12,'2016-04-01')) AND (dateadd(month,-9,'2016-04-01'))) then 'Q1' END AS QUARTER\_FROM\_OBS\_DT,

[Nbr Of Movements],[Movement Amount GBP]

FROM [Latentview].[CORP\CO57430].[Movement\_set2] where [Movement Cal Date] BETWEEN (dateadd(month,-12,'2016-04-01')) AND '2016-03-31') x) A

GROUP BY [Mandate ID]) T JOIN

(SELECT

Mandate\_ID,

coalesce(MAX(AUM\_3M),0) MAX\_AUM\_3M,

coalesce(MAX(AUM\_6M),0) MAX\_AUM\_6M,

coalesce(MAX(AUM\_9M),0) MAX\_AUM\_9M,

coalesce(MAX(AUM\_12M),0) MAX\_AUM\_12M

FROM (

select [Mandate\_ID],

case WHEN QUARTER\_FROM\_OBS\_DT='Q4' THEN AUM END AS AUM\_3M,

case WHEN QUARTER\_FROM\_OBS\_DT in ('Q4','Q3') THEN AUM END AS AUM\_6M,

case WHEN QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2') THEN AUM END AS AUM\_9M,

case WHEN QUARTER\_FROM\_OBS\_DT in ('Q4','Q3','Q2','Q1') THEN AUM END AS AUM\_12M

from (

select [Mandate\_ID],

[AUM],

CASE WHEN ([Date] BETWEEN (dateadd(month,-3,'2016-04-01')) AND '2016-03-31') then 'Q4'

WHEN ([Date] BETWEEN (dateadd(month,-6,'2016-04-01')) AND (dateadd(month,-3,'2016-04-01'))) then 'Q3'

WHEN ([Date] BETWEEN (dateadd(month,-9,'2016-04-01')) AND (dateadd(month,-6,'2016-04-01'))) then 'Q2'

WHEN ([Date] BETWEEN (dateadd(month,-12,'2016-04-01')) AND (dateadd(month,-9,'2016-04-01'))) then 'Q1' END AS QUARTER\_FROM\_OBS\_DT--,

--[Nbr Of Movements],[Movement Amount GBP]

FROM [Latentview].[CORP\CO57430].[Total\_AUM\_2]

where [Date] BETWEEN (dateadd(month,-12,'2016-04-01')) AND '2016-03-31') x) A

GROUP BY [Mandate\_ID]) M ON T.[Mandate ID]=M.Mandate\_ID;

### Last Transaction Days

select distinct M.[Mandate ID],

datediff(day,MONEY\_IN\_LATEST\_DATE,'2015-10-01') as last\_money\_in\_days,

datediff(day,MONEY\_out\_LATEST\_DATE,'2015-10-01') as last\_money\_out\_days,

datediff(day,SWITCH\_IN\_LATEST\_DATE,'2015-10-01') as last\_switch\_in\_days,

datediff(day,SWITCH\_OUT\_LATEST\_DATE,'2015-10-01') as last\_switch\_out\_days,

datediff(day,TRANSFER\_IN\_LATEST\_DATE,'2015-10-01') as last\_transfer\_in\_days,

datediff(day,TRANSFER\_OUT\_LATEST\_DATE,'2015-10-01') as last\_transfer\_out\_days

from [Latentview].[CORP\CO57430].[Movement\_set2] m left join

(select [Mandate ID],

max([Movement Cal Date]) as MONEY\_IN\_LATEST\_DATE

from [Latentview].[CORP\CO57430].[Movement\_set2]

where [Movement Type]='Money In'

group by [Mandate ID]) mi

on m.[Mandate ID]=mi.[Mandate ID] left join

(select [Mandate ID],

max([Movement Cal Date]) as MONEY\_out\_LATEST\_DATE

from [Latentview].[CORP\CO57430].[Movement\_set2]

where [Movement Type]='Money Out'

group by [Mandate ID]) mo

on m.[Mandate ID]=mo.[Mandate ID] left join

(select [Mandate ID],

max([Movement Cal Date]) as SWITCH\_IN\_LATEST\_DATE

from [Latentview].[CORP\CO57430].[Movement\_set2]

where [Movement Type]='Switch In'

group by [Mandate ID]) si

on m.[Mandate ID]=si.[Mandate ID] left join

(select [Mandate ID],

max([Movement Cal Date]) as SWITCH\_OUT\_LATEST\_DATE

from [Latentview].[CORP\CO57430].[Movement\_set2]

where [Movement Type]='Switch Out'

group by [Mandate ID]) so

on m.[Mandate ID]=so.[Mandate ID] left join

(select [Mandate ID],

max([Movement Cal Date]) as TRANSFER\_IN\_LATEST\_DATE

from [Latentview].[CORP\CO57430].[Movement\_set2]

where [Movement Type]='Transfer In'

group by [Mandate ID]) TI

on m.[Mandate ID]=TI.[Mandate ID] left join

(select [Mandate ID],

max([Movement Cal Date]) as TRANSFER\_OUT\_LATEST\_DATE

from [Latentview].[CORP\CO57430].[Movement\_set2]

where [Movement Type]='Transfer Out'

group by [Mandate ID]) tro

on m.[Mandate ID]=tro.[Mandate ID]

--where m.[Mandate ID]='a1r200000008yfFAAQ'

### Email

--- Campaign id’s with one send definition id is considered to extract data.

select distinct m.id as mandate\_id,EM.CONTACT\_\_C,f.id as campid,f.startdate,

1 as No\_Of\_Emails\_Sent,

case when em.opened\_\_c='true' then 1 else 0 end as No\_Of\_Emails\_Opened,

case when em.clicked\_\_c='true' then 1 else 0 end as No\_Of\_Emails\_Clicked

from

tcampaign f

join SEND\_JUNCTION s on f.id=s.ET4AE5\_\_CAMPAIGN\_\_C

JOIN INDIVIDUAL\_EMAIL\_RESULTS\_NEW EM on em.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION\_\_C

join tcontact c on c.id=em.contact\_\_c

join taccount a on a.id=c.accountid

join tmandate m on a.id=m.accountx

where a.typex||a.account\_sub\_type in

--- The following categories in account type and sub type were considered to extract data

('Corporate',

'CorporateAsset Manager',

'CorporateEmployer',

'CorporateGovernment',

'CorporateInsurance',

'CorporateInvestment Trust',

'CorporateSuperannuation',

'CorporateUnion',

'Fiduciary',

'FiduciaryAdvisory',

'FiduciaryAsset Manager',

'FiduciaryImplemented Consultancy',

'FiduciaryMulti Manager',

'FiduciaryPension Delivery Organisation',

'Insurance',

'InsuranceEmployer',

'InsuranceInsurance',

'PlatformPlatform DC',

'Public Sector',

'Public SectorCentral Bank',

'Public SectorGovernment',

'Public SectorSovereign Wealth Fund',

'Public SectorUK Local Authority',

'Strategic Partner',

'Strategic PartnerSub Advisory',

'Tax-Exempt Organisation',

'Tax-Exempt OrganisationCharity',

'Tax-Exempt OrganisationEmployer',

'Tax-Exempt OrganisationEndowment',

'Tax-Exempt OrganisationFoundation',

'Tax-Exempt OrganisationHealthcare',

'Investment Consultant',

'Independent Trustees',

'Independent Advisor',

'Actuary'

)

--- The following flags were considered to get the details of active accounts

AND a.delete\_flag='N'

and a.inactive='false'

AND c.delete\_flag='N'

and c.inactive='false'

and f.recordtypeid != '012w000000068VFAAY'

and f.delete\_flag='N' and f.numberofcontacts >10

AND f.createddate between '01-OCT-14' AND '30-SEP-15'

and em.createddate between '2014-09-30T11:59:59.000Z' and '2015-09-30T11:59:59.000Z'

AND F.ID IN (select c.id

from tcampaign c join SEND\_JUNCTION s on c.id=s.ET4AE5\_\_CAMPAIGN\_\_C

join INDIVIDUAL\_EMAIL\_RESULTS\_NEW i on i.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION\_\_C

where c.recordtypeid!='012w000000068VFAAY' and c.numberofcontacts >10

and c.delete\_flag='N' and c.createddate between '01-OCT-14' AND '30-SEP-15'

group by c.id

having count(distinct s.ET4AE5\_\_SENDDEFINITION\_\_C)=1

)

and F.ID IN (select f.id from

tcampaign f

join SEND\_JUNCTION s on f.id=s.ET4AE5\_\_CAMPAIGN\_\_C

JOIN INDIVIDUAL\_EMAIL\_RESULTS\_NEW EM on em.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION\_\_C

where s.ET4AE5\_\_SENDDEFINITION\_\_C in

(select s.ET4AE5\_\_SENDDEFINITION\_\_C

from tcampaign c join SEND\_JUNCTION s on c.id=s.ET4AE5\_\_CAMPAIGN\_\_C

join INDIVIDUAL\_EMAIL\_RESULTS\_NEW i on i.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION\_\_C

where c.recordtypeid!='012w000000068VFAAY' and c.numberofcontacts >10

and c.delete\_flag='N' and c.createddate between '01-OCT-14' AND '30-SEP-15'

group by s.ET4AE5\_\_SENDDEFINITION\_\_C

having count(distinct s.ET4AE5\_\_CAMPAIGN\_\_C)=1

))

GROUP BY m.id,EM.CONTACT\_\_C,f.id,f.startdate

### Campaigns

--- Campaign id’s which joins with more than one send junctions id is considered to extract data.

select distinct d.id as mandate\_id,c.id AS CONTACT\_ID,c.name AS CONTACT\_NAME,

n.id as campid,m.id as campmem,n.startdate,

1 AS TotalNumberOfInvites,

CASE WHEN m.hasresponded='true' THEN 1 ELSE 0 END AS TotalNumberOfResponses--,

from taccount a join tcontact c on a.id=c.accountid

left join tcampaignmember m on c.id=m.contactid

left join tcampaign n on n.id=m.campaignid

left join tmandate d on a.id=d.accountx

where

a.delete\_flag='N'

and a.inactive='false'

AND c.delete\_flag='N'

and c.inactive='false'

and n.recordtypeid != '012w000000068VFAAY'

and n.delete\_flag='N' and n.numberofcontacts >10

and n.inactive='false'

AND n.createddate between '01-jul-17' AND '30-sep-17'

and m.delete\_flag='N'

and n.typex != 'Master List'

and n.startdate between '01-jul-17' AND '30-sep-17'

AND n.ID not IN (select c.id

from tcampaign c join TET4AE5\_\_SENDJUNCTION s on c.id=s.ET4AE5\_\_CAMPAIGN

join INDIVIDUAL\_EMAIL\_RESULTS i on i.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION

where c.recordtypeid!='012w000000068VFAAY' and c.numberofcontacts >10 --AND ET4AE5\_\_CAMPAIGN='701w0000000epguAAA'

and c.delete\_flag='N' AND c.CREATEDDATE between '01-jul-17' AND '30-sep-17' AND c.typex!='Master List'

and c.inactive='false'

group by c.id

having count(distinct s.ET4AE5\_\_SENDDEFINITION)=1

--order by count(distinct s.ET4AE5\_\_SENDDEFINITION)

)

and n.ID not IN (select f.id from

tcampaign f

join TET4AE5\_\_SENDJUNCTION s on f.id=s.ET4AE5\_\_CAMPAIGN

JOIN INDIVIDUAL\_EMAIL\_RESULTS EM on em.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION

where s.ET4AE5\_\_SENDDEFINITION in

(select s.ET4AE5\_\_SENDDEFINITION--,count(distinct s.ET4AE5\_\_SENDDEFINITION) --as campaign\_id

from tcampaign c join TET4AE5\_\_SENDJUNCTION s on c.id=s.ET4AE5\_\_CAMPAIGN

join INDIVIDUAL\_EMAIL\_RESULTS i on i.senddefinition\_\_c=s.ET4AE5\_\_SENDDEFINITION

where c.recordtypeid!='012w000000068VFAAY' and c.numberofcontacts >10 --AND ET4AE5\_\_CAMPAIGN='701w0000000epguAAA'

and c.delete\_flag='N' and c.createddate between '01-jul-17' AND '30-sep-17'

group by s.ET4AE5\_\_SENDDEFINITION

having count(distinct s.ET4AE5\_\_CAMPAIGN)=1

--order by count(distinct s.ET4AE5\_\_SENDDEFINITION)

))

## Iteration 3 - Profiling

### Model Performance across AUM Segments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **AUM Bucket** | **Number of Actual Disinvestment** | **Number of predicted Disinvestment by risk ratings** | **Number of Predicted Disinvestment by Model 3** | **% captured**  **By risk ratings** | **% captured**  **By Model 3** |
| 1-5m | 221 | 13 | 153 | 6% | 69% |
| £630 m | £41 m | £432.5 m | 7% | 69% |
| 5-25m | 256 | 29 | 143 | 11% | 56% |
| £2.55 bn | £301 m | £1.5 bn | 12% | 59% |
| 25-100m | 110 | 22 | 66 | 20% | 60% |
| £5.1 bn | £1.1 bn | £3.3 bn | 22% | 65% |
| 100-500m | 30 | 3 | 12 | 10% | 40% |
| £4.5 bn | £392.5 m | £1.5 bn | 9% | 33% |
| >500m | 2 | 0 | 1 | 0% | 50% |
| £3.5 bn | £0 | £1.7 bn | 0% | 49% |
| **Total** | **619** | **67** | **375** | **11%** | **61%** |
| **£16.3 bn** | **£1.86 bn** | **£8.5 bn** | **11%** | **52%** |

56% of the mandates were accurately predicted as disinvestment under AUM size >25 Million. Hence, it can be said that the model has decent predictive power in case of high value mandates.

## Iteration 4 – 600 Out of Samples

**Model Performances**

Random 30% (600) of the mandates were selected and removed from the development sample (S1 to S7) and test sample (S8 to S9) to test the model performance on new mandates the model had not seen before.

Extreme Gradient Boosting technique was used to develop the model on the training sample and tested on the validation sample and test sample.

**Confusion Matrix**

Model Predicted Vs Not Predicted

Performance of S8 snapshot without overlap in train set *(on mandates hidden from training set)*

|  |  |  |
| --- | --- | --- |
|  | Predicted Non-Disinvestment | Predicted Disinvestment |
| Actual non-disinvestment | 444 | 54 |
| Actual disinvestment | 54 | 41 |

AUC dropped to **0.712.** K Statistics **– 0.34**

**Comparison with Current Risk Rating (With Overlap)**

The following table shows results of prediction over test dataset and comparison with the existing Risk Rating by Client Director/Relationship Manager:

**Comparison with Current Risk Rating (Without Overlap – out of sample mandates)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Disinvestment** | | **Current risk rating prediction** | | | **Model 3** | | |
|
| Number | Value | Number | Value | % Of Actual Value | Number | Value | % Of Actual Value |
| 95 | £4.17 bn | 10 | £0.34 mn | 8.2% | 41 | £2.80 bn | 67% |

\*High risk is being considered from Current risk rating

Significant Variables

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Attribute** | **Metrics** | **Definition** |
| 1 | Consultant Rating | Current Consultant Rating | Mandate level rating based on the fund composition and fund rating given by the external consultants |
| 2 | Servicing Interactions | Valuation cases 12 months | Number of valuation cases raised by the mandate in the last 12 months |
| 3 | Mandate Related | Age of Mandate | Time Duration in which mandate has been funded with SLI (in months) |
| 4 | Servicing Interactions | Unresolved Cases | Number of unresolved cases for a mandate in the last 12 months |
| 5 | Transaction Behaviour | % Money out in last 12 months | Percentage of money outflow compared to maximum AUM in last 12 months |
| 6 | Servicing Interactions | Last Case Days | Number of days since mandate raised its last case |
| 7 | Campaign | Last campaign days | Number of days since the mandate received a campaign invite |
| 8 | Transaction Behaviour | Last Money In days | Time duration between last money inflow and snapshot start date (in days) |
| 9 | Transaction Behaviour | Last Money Out Days | Time duration between last money outflow and snapshot start date (in days) |
| 10 | Mandate Related | Lead Fund | Fund Code of Major Fund in the mandate (major part of AUM is comprised of this fund) |
| 11 | Mandate Related | Region | Client Region |
| 12 | Mandate Related | Mandate Performance 12 months | The percentage change in the mandates worth(AUM) in the last 12 months |