FY 2015 Policy Portfolio Analysis

The purpose of this report is to provide senior management with an understanding of the makeup of the company's insurance portfolio incepted in the 2015 financial year (July 2014-June 2015), and highlight factors influencing profits and losses/claims on policies written by the company.

Summary of portfolio[1]

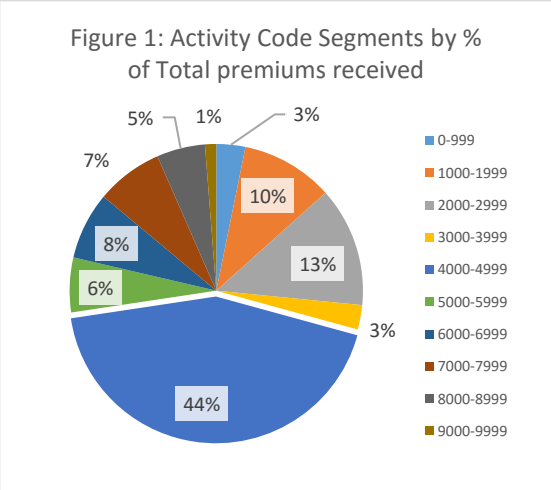
Table 1 shows summary data for the portfolio since inception date for the most important measures considered in this report. The portfolio has yielded a total profit of £1.16m over three years, and has only seen 16 claims over this period, with an average loss ratio per policy of 4.3%. The average client size (by turnover[2]) is £14.46m. This is thus a very low risk portfolio.

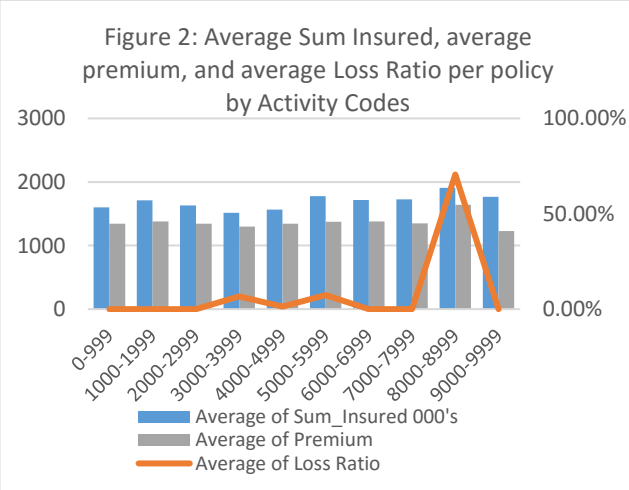
In the next sections, this report will sub-segment policy and client data, to gain insight on the portfolio by Activity Code, client turnover, and premiums.

Table 1

Total Number of Policies	1173
Number of Claims	16
Average of Loss Ratio	4.3%
Total premiums	1597446.43
Average premium per policy	1361.85
Average profit per policy	989.01
Total profit	1160105.10
Average client turnover	14461621.62

Activity Code





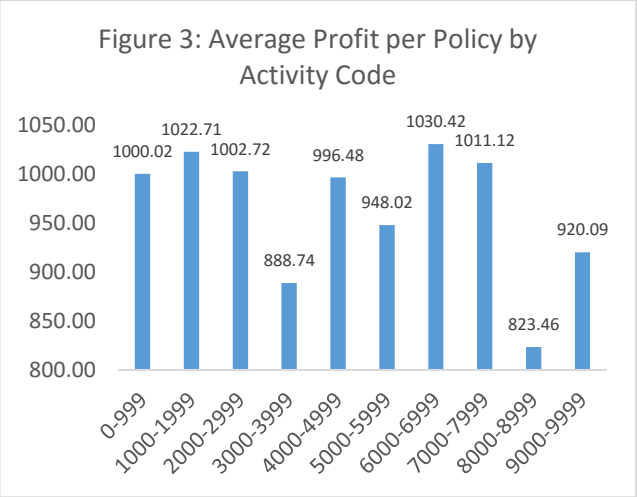
The importance of each Activity Code segment to the business can be established by its contribution to the % share of the Total premiums received (see Figure 1).

Clearly, the activity segment 4000-4999 is the most important contributor of premiums to the business at 44%, with codes 2000-2999 in second place with 10% of total premiums received.

[1] Note that policy IPJS011646, a policy with a £500,000 premium and a Sum Insured of £300,000 has been excluded from the analysis due to this being a likely data quality error. This policy also has a claim associated with it, however the claim incurred is zero.

[2] It is assumed that turnover refers to the Revenue generated by the client's business in FY15

Analysing the data at a more granular (per policy) level, Figure 2 plots the average premium, average sum insured, and average loss ratio per policy across the Activity Codes (x-Axis). Figure 3 plots the profit[3] per policy and profit as a percentage of the sum insured. These figures help establish which segments are the most revenue- and profit-generating *per policy*, and give a short-term indication of risk.



The key findings are:

1. The most important Activity Code segment to the business on a total premium and total profit basis (4000-4999) does not turn the highest profit on a per policy basis. Loss Rates in this segment are healthy and close to zero. This is the "Cash Cow" Activity Code segment of the portfolio.
2. The most profitable segment on a per-policy basis is Activity Code Segment 6000-6999, which currently accounts for 8% of total premiums. Management should seek to expand sales in this market while maintaining current pricing levels.
3. Activity Code segment 8000-8999 is the most unattractive in the portfolio.
    a. This segment has the lowest per policy profit in the portfolio at £843.46.
    b. The average Loss ratio for the second largest Activity Codes segment (8000-8999) is very large This is due to two very high claims within this Activity Code set.
    c. The average sum insured per policy is the highest at £1,641,000.
    d. Consequently, this Activity Code segment requires further investigation, and the business should consider focussing on selling policies in more profitable activity segments.

Client Turnover[4]

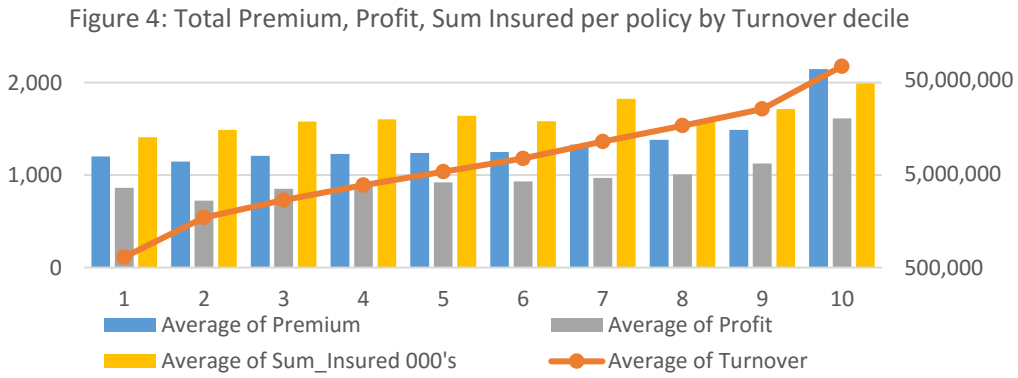


Figure 4 shows the portfolio data segmented by client turnover deciles, using FY2015 turnover figures. This provides an understanding of the portfolio by client size.

Analysis of figure 4 shows:

1. The average premium per policy increases with company size. This is potentially due to the Sum Insured also showing an increasing trend across turnover segments. The first turnover decile is the only exception to this rule.
2. The average profit per policy increases with client turnover. Again, the first turnover decile is the exception.
    a. Consequently, large clients in the 10th turnover decile, with an average turnover of £70m are the most profitable segment for this insurance company on a per policy basis, but also on a total profit basis (see Figure 5).

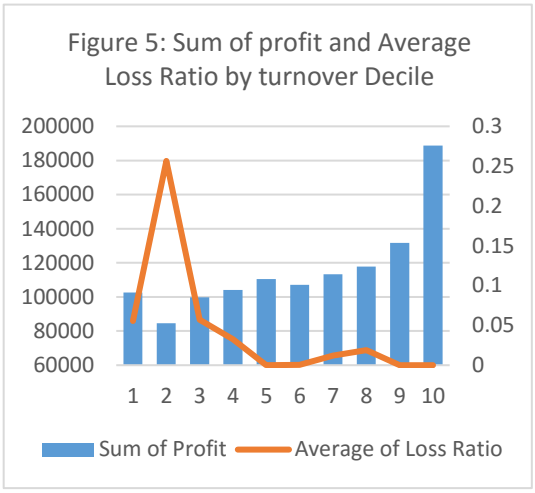
[3] profit is calculated as $Premium - Commission - Claims$ for each Activity Code segment.

Examining the Activity Code profits for each turnover decile, it could be concluded that Activity Codes are a less significant factor in determining profits than the turnover decile to which the client belongs. For example, the 10th turnover decile is especially profitable for Activity codes 8000-8999, the most unprofitable Activity Code segment overall.

Figure 5 shows the total profit by and the average loss ratio per policy by turnover decile. It shows that:

1. The largest clients contribute the largest total profits to the portfolio. Decile 1 has high profits compared to its average turnover size.
2. Portfolio losses are concentrated in smaller businesses - clients with smaller turnovers are more likely to claim on their policies.

In summary, turnover is a good determinant of profit per policy. The insurance company should consider expanding their business to the larger end of the SME business segment, particularly since these businesses are less risky. clients in turnover decile two need to be more closely analysed to determine the cause of significant loss ratios.



Premium written

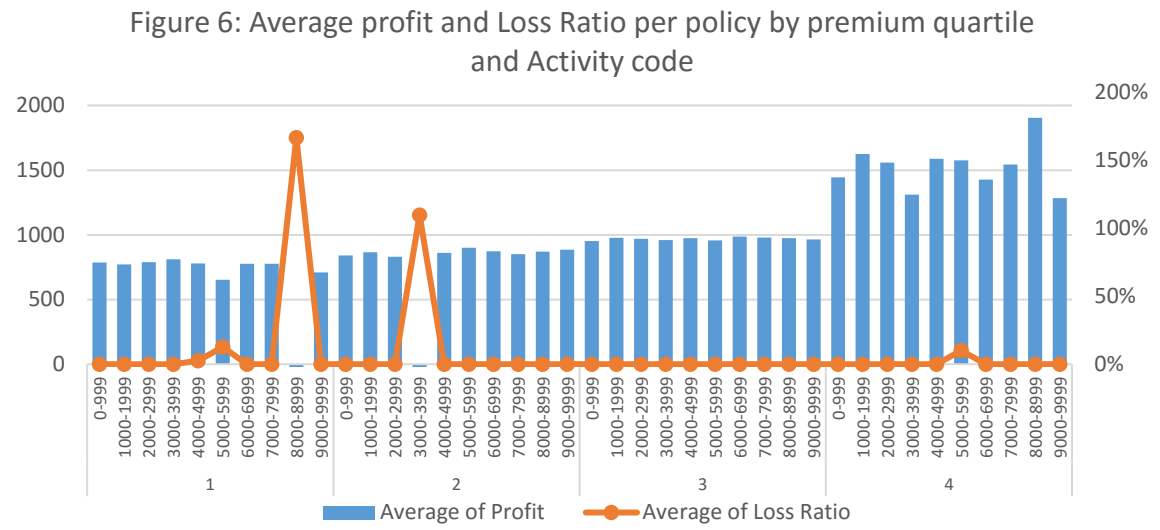


Figure 6 shows the average profit and average loss ratio by premium quartile and activity segment. It shows that:

1. The top premium quartile has the highest profit per policy, across all Activity Codes.
2. Activity codes do not seem to determine profit as significantly as the premium quartile.
3. Losses are staggered in the lower premium segments of the portfolio. This is surprising, since one would expect higher risk policy to incur a higher premium.

In conclusion, there is a need for the company to potentially re-evaluate its pricing and risk estimation models. Given the data available, the company is mispricing risk/claims ex ante.

Insights

Profitability of client companies by EBIT

The number of clients with positive EBIT are shown by year in the table below:

Year	No. of profitable clients
2011	948
2012	954
2013	974

Rapidly growing client companies

A "rapidly growing" company will be defined, for this report, as those SMEs with employee growth higher than the average UK job growth rate over the period of 2011 to 2013 (1.13%).[5] Many clients in this Portfolio have no direct employees. Also, many other clients have gone from zero employees to a positive number of employees, which in theory is infinite growth. These companies are excluded from the analysis, leaving a population of 1040 SMEs. In total, under this definition, there are 428 client companies who experienced high growth over the 2011-2013 period. These companies are further detailed by average employee growth quartile in the table below.

Quartile	Average employee growth 2011-2013	Number of companies in quartile
1	2.87%	109
2	7.30%	105
3	16.58%	107
4	90.98%	107
Total	29.41%	428

EBIT as an indicator of claims and Next Steps of investigation

The above analysis on turnover showed that low-turnover companies have seen higher loss ratios. This section will test whether EBIT (Earnings Before Interest and Tax) are a good indicator of claims. It makes intuitive sense for profitable clients (i.e. those with higher EBIT) to file a smaller number of claims than companies making losses, given that the type of insurance provided is protecting clients against risks endangering the continuation of business.

However, from the total population of policies, only 16 policies experienced claims, 6 of which have a zero-value incurred. A simple linear regression of average EBIT (2011-2013) on number of claims yields an R-squared of 0.0006.

Regression Statistics	
Multiple R	0.023993
R Square	0.000576
Adjusted R Square	-0.00028
Standard Error	0.116058
Observations	1173

On this basis, the hypothesis that EBIT is an accurate indicator of incurred claims must be rejected. This is not surprising - note that we are testing using EBIT values which are up to three years old.

Consequently, the next step would be to seek more relevant EBIT data. The most relevant data is historical data, since EBIT at time of the claim/expiration of contract should be compared against claims incurred.

[5] Calculated from Office of National Statistics data
https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/timeseries/mgrz/lms

Bonus

An algorithm that estimates the current premium for each policy would potentially make use of multi-factor (e.g. multi-linear) regression analysis. Firstly, a multi-linear regression model would be run on a large, up-to-date, set of data. This would help determine the influence (the beta coefficients) of each of the factors (e.g. Activity Code, turnover, Sum_Insured, Excess) on the current premium (the dependent variable). Once the beta coefficients have been determined, the algorithm would instruct the user to plug in values for each of the four above factors, and return an estimate for the current premium (see equation estimate below).

Assumptions this approach makes is that a) the independent variables (Activity Code Segment, turnover, Sum_Insured, Excess), are in fact independent of each other, are statistically significant, and can be modelled statistically, b) the data on which the regression is run has been appropriately cleansed for statistical analysis, and c) the data is constantly updated to present the best coefficient estimates.

If we run a multi-linear regression on the (uncleansed) data as provided (except for the exclusion of policy IPJS011646), the following equation yields an R-squared of 0.776 and a multiple R of 0.88 at a 95% confidence interval:

$$y_{Premium} = 197.32 + 0.0006 * x_{SumInsured} + 0.015 * x_{Excess} + 9.8 * 10^{-6} * x_{Turnover} + 0.008 * x_{ActivityCodeSegment}$$

Among these four factors, per the P-value, only Sum_Insured and turnover are statistically significant determinants of the premium in this equation.

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.880917711							
R Square	0.776016014							
Adjusted R Square	0.775248946							
Standard Error	384.959591							
Observations	1173							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	4	599690054.7	1.5E+08	1011.664631	0			
Residual	1168	173090459.7	148193.9					
Total	1172	772780514.4						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	197.3245273	33.08002256	5.965066	3.23694E-09	132.4216186	262.2274359	132.4216186	262.2274359
Sum_Insured	0.000600321	1.42807E-05	42.03714	5.903E-236	0.000572303	0.00062834	0.000572303	0.00062834
Excess	0.015020156	0.256860221	0.058476	0.953379487	-0.48893886	0.518979168	-0.488938855	0.518979168
Turnover	9.82239E-06	3.74042E-07	26.26014	7.9786E-120	9.08852E-06	1.05563E-05	9.08852E-06	1.05563E-05
ACTIVITY CODE SEGMENT	0.008982844	0.005700627	1.575764	0.115350978	-0.00220177	0.020167458	-0.00220177	0.020167458