

SAMPLE ASSIGNMENT, QUANTITATIVE RESEARCH

NB: this assignment was *not* written as a journal article (nor was it written for module BMPF7102), so several aspects of it do not meet BMPF7102 Learning Outcomes. However, as in BMPF7102, secondary data were used (a very large data set -please refer to Excel file). The 'Methods' and 'Results' sections of the account are very robust.

Occasional explanatory comments are included in red.

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Title: An Analysis of household data from the UK

Introduction and Literature Review

An Introduction and Literature Review was not required for this particular assignment.

However, a typical journal article would normally start with an outline the state of current research in the selected topic, making reference to specific authors, articles etc. The rationale for the research would also be explained in this section.

Methods

a. Methods used to generate data

The method used to generate the data set used for analysis was a survey of UK households. It was carried out on behalf of the Bank of England by NMG Consulting, an independent consultancy firm within the financial services sector, in September 2011. It primarily focused on collecting financial data and opinion on UK economic policy and its impact on the survey respondents.

It appears to qualify as a descriptive survey based on Gill and Johnson's definition i.e. it addresses 'the particular characteristics of a specific population of subjects, either at a fixed point in time or at varying times for comparative purposes.' Gill and Johnson (2011: 126).

The sample group consisted of 1,985 households. It was conducted face to face at the home of the participant(s) with Computer Assisted Personal Interviewing (CAPI) between the 23rd and 29th of September 2011. (Kamath et al., 2011)

The survey was designed by combining the questions from an Ipsos MORI survey, Capibus, that is carried out weekly with further questions relating to household finances and wealth being added. (Kamath et al., 2011). The survey was weighted in order to compensate for bias and ensure the results were representative of UK households as a whole. (Kamath et al., 2011).

The survey uses a semi-quantitative methodology resulting in the generation of primary data. This data is a combination of scale data, i.e. numerical data with clear fixed intervals (e.g. number of people in the household), ordinal data, i.e. data which can be ranked in order but with differentials that are subjective (e.g. level of concern with debt level), and nominal data, i.e. data that describes categories (e.g. regions). The questions are a combination of open and closed questions and are made up of facts and opinions.

According to Kamath et al. (2011), an online survey was conducted in parallel with the NMG Bank of England survey for the first time that year. This was done to 'gain a better understanding of differences between results using the two modes of survey, and with a view to potentially moving the entire survey online in the future.' (Kamath et al., 2011: 305). The published results were from the face to face survey but following the online pilot the entire survey has been moved online. By conducting both surveys through different media i.e. face to face and online there would have been additional data to test reliability of the survey.

Anderson et al. (2016) however, express concerns around the data reliability based on the sampling of the Bank of England Household Survey. 'All surveys face the problem that non-response may not be random, even when the sampling probabilities are known, but selection on unobservables may be more of an issue with the NMG Survey.' Anderson et al. (2016 : 134). As a result they go on to stress the importance of comparing results from this survey to those of other surveys.

b. Ethical considerations.

Ethical issues were important within the module for which this account was originally written, hence there is extensive coverage of ethics in the account. Though there should always be some reference to Ethics in articles, but there would not normally be such detail.

Gray (2014) and Berghmans (2007) discuss two opposing standpoints within ethics. The first is the Teleological or utilitarian absolutism stand point where the researcher believes that the end justifies the means. The opposing view is the Deontological or non-consequentialists position where the researcher believes that the end never justifies the means.

Ethical considerations can arise at all stages of the research from design to sampling, from conducting the research to reporting the results. While it is not stated what ethical procedures were followed for the NMG Bank of England survey there is one example of ethics being considered in the design of the survey. According to Kamath et al., (2011) the researchers of the NMG Bank of England survey showed coded cards to the survey participants for questions in connection with sensitive financial information. This meant the survey participants could respond to the question without the interviewer knowing the detail of their response. From an ethical perspective it would have provided an additional layer of confidentiality as well as potentially reducing any distress or embarrassment caused by sharing this information with the interviewer.

Privacy, confidentiality and consent are key areas within ethics associated with surveys that are highlighted by Gray (2014) and Cohen et al. (2011). They stress that consent should be informed and participation should be voluntary. They also argue that the research participant should have the right to refuse to answer questions in a survey and to withdraw from the research at any time regardless of the methodology. The Bank of England survey include responses labelled 'refused' which indicates the participants had the option of refusing to answer the question.

The level of disclosure around the aims of the research and what it will be used for is a slightly greyer area. There are cases where it would be detrimental to the research to divulge the aim of the research. This is known as deception and can be active or passive. Berghmans (2007) argues that this is not uncommon practice in research. Berghmans (2007) uses the Milgram obedience experiments as examples of active deception. This was where the research subjects falsely believed they were giving electric shocks to other individuals when this was not the case. Berghmans (2007) uses placebo studies as examples of passive deception as the participant does not

know which group they are in and therefore which intervention they will be given. It could be argued that for a survey such as the NMG Bank of England survey deception should not be an issue and that full disclosure can be given.

Factors such as the vulnerability of the research participant and the type of data being collected from them can increase the ethical scrutiny of a piece of research. In the NMG Bank of England survey the participants are adults who can choose whether or not to answer the questions honestly or at all. Whereas in some studies, especially in areas such as health and education, the participants may be children or vulnerable adults and the data being collected may be extremely confidential such as disease indicators, drug use etc. Within the NMG Bank of England survey the data collected, all be it opinion led rather than factual data, is still sensitive. Therefore, ethical issues such as ensuring anonymity and the Bank of England being transparent about what they intend to do with this data are important.

In addition to a general code of ethics being considered other regulatory requirements such as data protection legislation will also need to be adhered to. There may also be specific ethical guidelines from the professional body that the research is being conducted on behalf of. This could be the university the researcher is connected with or in the case of health research a body such as The British Medical Association.

There is a further dimension that brings its own set of ethical considerations, this is insider research.

Insider research predominantly takes place 'within the researcher's own work practice.' (Costley et al., 2010 : 1). In general, there are advantages of insider research. The researcher could be deemed to have a unique knowledge and perspective of the organisation being researched that an external researcher would not have (Costley et al., 2010). It is this combination of knowledgeable employee and disciplined researcher, Costley (2010) argues, that is the key to successful insider research. Furthermore, a strong argument for allowing insider research within the organisation, especially through action research is that it will create change. While this may be positive there is a risk that it could have a negative impact e.g. job cuts

resulting from the research findings that the insider researcher had produced. The ethics around the impact of the research on its subjects takes on a unique dimension for the insider researcher as their research subjects could also be their colleagues.

With standard research, the researcher's objectives are subject to the influence of the academic body they are part of and more specifically the ethical policies and code of practice (Costley et al., 2010) which that academic body has developed or is subject to. The research objective set by an insider researcher could also potentially be influenced by the organisation that they work for, connected organisations such as trade unions and wider industry and sector regulation. A compromise between the objective of the researcher, the requirements of the organisation and the policies of the academic institute is therefore needed.

Gaining access to participants could be challenging within insider research and the balance of power could impact the way the insider researcher carries out their research. For example, the insider researcher may feel intimidated interviewing certain members of the organisation. As mentioned previously, a core element of research ethics is the right of the participant to anonymity. Costley et al. (2010) argue that guaranteeing anonymity is not possible within insider research, a view supported by Gill and Johnson (2011) who extend this to the anonymity of the organisation as a whole. Further issues arise if the insider researcher wishes to hide the true objective of their research in order for this not to impact the results (Gill and Johnson, 2011).

The bias of the insider researcher is a further concern. A common criticism of insider research is the subjectivity of the insider researcher. There are ways to combat this at the design and analysis stage according to Costley et al. (2010) e.g. data triangulation.

Based on the premise that the researcher needs to be part of the organisation being researched in order it to be classed as insider research, I would argue that there are no insider research issues around The Bank of England 2011 Household Survey. It was conducted by an independent body (NMG Consulting) from that which

commissioned the survey (the Bank of England). The survey was of consumers not employees or members of either organisation.

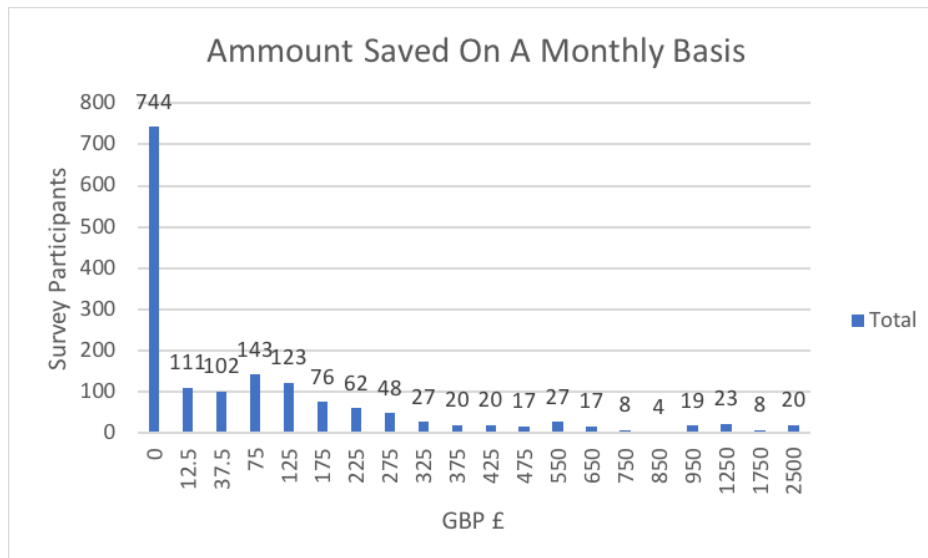
c. Analysis of data

The analysis focuses primarily on indicators of economic prosperity. Through the analysis the intention was to discover if there are statistically significant relationships between variables such as age, region and house value, with indicators of economic prosperity i.e. savings, debt and income levels. Whilst terms used in this paper will be generic e.g. debt, the variable name as it appears in the data set will be shown in brackets the first time it is mentioned in order to clarify which data variable was used e.g. debt (xpus_a). Microsoft Excel was used to clean and analysis the data through a combination of pivot tables, formulae and data analysis tools.

Prior to each statistical test and calculation, the data was cleansed by removing 'Don't Know', 'Refused', 'Not applicable' responses and blank cells which according to the survey notes denote missing responses. It was also assumed there was a normal distribution of the survey data.

Results

The first area that was examined was savings. The mean, median and mode for household monthly savings was calculated using the midpoint monthly savings data (saveamount_a). The mode i.e. the value that occurs most often, was £0. As can be seen from Chart 1, 744 out of a total sample 1,619 claimed they do not save any money on a monthly basis which is 46% of the sample. The mean, or average amount saved per month was £154.90 while the median or midpoint was £12.50. The median is a significantly lower value than the mean which indicates there is an uneven distribution of data which is concentrated at the lower end of the range as indicated in Chart 1 below.



(Chart 1)

In order to get a deeper understanding of which variables relate more strongly to savings, a correlation analysis was undertaken using other midpoint data showing total savings (nvesttot_a); monthly savings (saveamount_a); income midpoint (fihhyr_a); house value (hsval_a) and age (age) (see table 1 below). The strongest correlation, i.e. that which is closest to 1, exists between house value and total savings while the weakest correlation exists between age and monthly savings.

Table 1: Correlation Coefficients based on midpoint data.

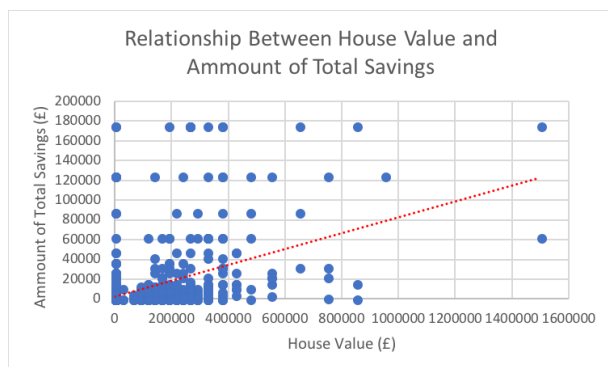
	Monthly Savings	Total Savings
Income	0.43	0.37
House Value	0.29	0.45
Age	-0.02	0.28

It should be noted that each sample used for each correlation analysis was slightly different due to data cleansing and survey data collection. For example, the income question was only asked of the principle income earner or main shopper in the household while age, savings and house value was asked of the entire sample. This combined with the removal of respondents as part of the data cleanse for refused responses etc. meant the sample groups compared were not identical in each correlation analysis. However, there were still over 500 respondents in each data

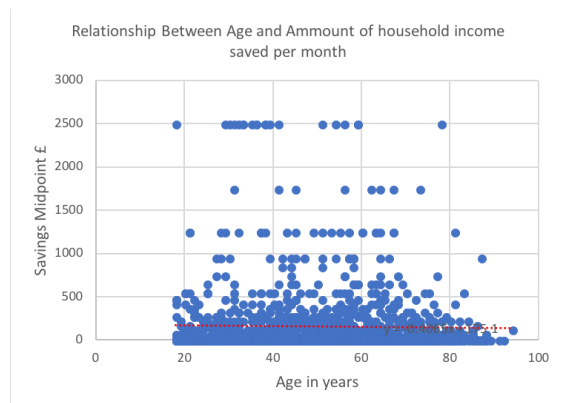
set. Furthermore, it should be noted that is also not clear whether income is referring to household income or the income of the respondent.

It could be argued that there is potential perception bias in the responses as each question asked the respondent their opinion on each value and therefore the data may not reflect the actual value and should therefore be treated with caution. It should also be noted that while there is correlation this does not indicate causality (Qureshi and Ibrahim, 2010) i.e. that higher house value causes increased savings.

The scatter graph below (chart 2) shows the highest correlating variables i.e. house value and total savings with a positive correlation demonstrated by the red trendline. While chart 3 shows the lowest correlating variables, i.e. age and monthly savings, with an almost horizontal trendline and a very slight negative correlation.



(Chart 2)



(Chart 3)

The second area that was analysed was income level. Specific focus was placed on investigating if there was any relationship between qualification level (qual) and income midpoint (fihhyr_a). In this instance the objective was to establish if there was a statistically significant difference between the income midpoint means of the qualification level groups. As the income midpoint data is numerical and there are more than two groups, a one-way or single factor ANOVA statistical test was used (see table 2 below). The null hypothesis i.e. that there is no difference in income midpoint between the six qualification level groups was rejected as the p-value was less than 0.05 i.e. 1.04012E-18. The alternate hypothesis, that there is a difference in income midpoints between the six qualification level groups was accepted.

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
masters/phd or equivalent	69	3634000	52666.7	1.5E+09
bachelor degree or equivalent (=nvq4)	69	2170750	31460.1	6.8E+08
a-level or equivalent (=nvq3)	69	2765250	40076.1	5.2E+08
gcse/o-level/cse	69	1505500	21818.8	3E+08
vocational qualifications (=nvq1+2)	69	1738750	25199.3	3.8E+08
no formal qualifications	69	1079250	15641.3	1.6E+08

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	62496006643	5	1.2E+10	21.0206	1.04012E-18	2.236109
Within Groups	2.42603E+11	408	5.9E+08			
Total	3.05099E+11	413				

(Table 2)

It should be noted that prior to conducting the single factor Anova test an additional step in the data cleansing was taken. The 'other' and 'still studying' categories were removed from the qualification data as it was not clear from these categories what the qualification level was of these participants. In order to run the Anova within Excel the groups needed to contain the same number of responses, however this may not be the case when using alternative analysis software such as SPSS . In order to achieve this a count was made of each group, the smallest count was 69 in the 'masters/phd or equivalent' category. A random group of 69 responses was therefore taken from the other five categories. A concern was that the sample size of each group may be too small. However, with regard to sample sizes for one-way ANOVA, Wilson Van Voorhis and Morgan (2007 : 48) cite Cohen (1988), stating 'Given a medium to large effect size, 30 participants per cell should lead to about 80% power (the minimum suggested power for an ordinary study) (Cohen, 1988).'

As there was a statistically significant difference in the means of the qualification level groups an option would be to investigate which pairs of data sets are causing the statistical significance with post hoc tests. However, it should be noted that running multiple post hoc tests increases the risk of identifying a statistical significance by chance and thus 'increases the possibility of incorrectly rejecting the null hypothesis.' (Nayak and Hazra, 2011 : 85).

The next set of variables that were analysed were income midpoints (fihhyr_a) and gender (sex). At face value there appears to be a difference between the income of men and women. The mean of the income midpoints for women was £30,282.14 while the mean of the income midpoints for men was £28,218.70 (see table 3 below). However, this is not enough information to know if this difference is statistically significant.

As the gender data is categorical and only has two groups and the income midpoint data is continuous, a t-test was chosen to test if there is a statistically significant difference in the means of these two groups. The p-value (see table 3) in both the one and two tail tests are more than 0.05 (0.09 and 0.18 respectively). Therefore, the null hypothesis i.e. that there is no difference in income level between men and women, is accepted.

t-Test: Two-Sample Assuming Equal Variances

	Male	Female
Mean	28218.7005	30282.1429
Variance	741518166	768009995
Observations	631	630
Pooled Variance	754753559	
Hypothesized Mean Diffe	0	
df	1259	
t Stat	-1.3335742	
P(T<=t) one-tail	0.09129233	
t Critical one-tail	1.64606482	
P(T<=t) two-tail	0.18258467	
t Critical two-tail	1.96185002	

Table 3

Following on from the t-test above, it was decided to compare gender with a different income data set. As well as the income midpoint (fihhyr_a) data used above, there was another income category in the survey (fihhyr2). This category grouped income into bands. A chi-square test was selected to analyse this data as according to Wilson Van Voorhis and Morgan 'The chi-square statistic is used to test the independence of categorical variables.' (2007 : 48) and in this case both the income and gender variables contained categorical data. Within the survey there were fifteen bands. These bands were then grouped into three bands, £0-£9,499; £9,500-£39,999 and >=£40,000 to align more closely with UK tax bands. The same null

hypothesis was used as in the previous t-test i.e. that there is no difference in income level between men and women.

Firstly, expected values were calculated from the actual values (see tables 4 and 5). The p-value was then calculated from the chi-square test and the result was 0.001786702. As the p-value is less than 0.05 the null hypothesis, that there is no difference in income level between men and women, was rejected and the alternate hypothesis, that there is a difference in income level between men and women, was accepted.

Actual Values			
	Female	Male	
£0-£9,499	122	174	296
£9,500- £39,999	354	306	660
>=£40,000	154	151	305
	630	631	1261

Table 4

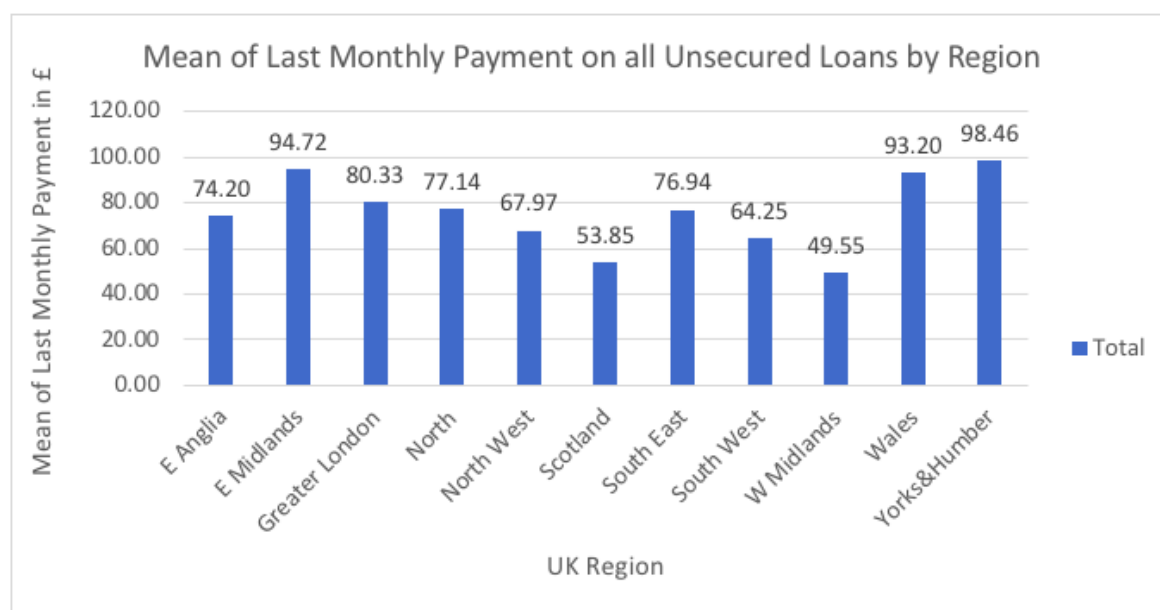
Expected Values			
	Female	Male	
£0-£9,499	147.882633	148.117367	296
£9,500- £39,999	329.738303	330.261697	660
>=£40,000	152.379064	152.620936	305
	630	631	1261

Table 5

It should be noted that the fact the chi-squared test p-value is less than 0.05 may have been caused by the amalgamation of the fifteen groups into three groups.

A further note of caution is that income is measured in this survey with a single question. Micklewright and Schnepf (2010) challenge the reliability of using a single question to measure income especially amongst women. 'Although individual income appears better measured by a single question than is household income, we found notable differences between the sexes with understatement for women.' Micklewright and Schnepf (2010 : 427). Therefore, while there is a statistically significant difference between the men and women in relation to income category, it could be argued that the survey data itself may be biased and should therefore be treated with caution.

The third area that was analysed was debt levels. There were a number of questions around debt within the survey. The data selected for this analysis was the midpoint data resulting from the following question: 'Taking into account of your unsecured debts, how much was your last monthly payment on all of the loans?' Bank of England (2011). The mean of the unsecured debt was £75.40. The relationship between unsecured debt (xpus_a) and region (region) (see chart 4) was examined further.



(Chart 4)

It should be noted that although the data was weighted within the survey Kamath et al., (2011) cite Redwood and Tudela (2004) in concluding that in general 'survey respondents are known to systematically under-record the value of their unsecured debt' Kamath et al., (2011 : 316).

While the mean may appear to differ between the different regions, it is important to understand if this difference is statistically significant. A single factor Anova test was conducted (see table 6 below). Once again, the sample groups contained different quantities of respondents. Therefore, as with the previously mentioned Anova test, conducted on the age and income data, the groups were randomly selected to match the number of respondents within the smallest group. In this case it was the 'Wales' category with 75 respondents. The p-value was 0.09905 (see table 6 below)

resulting in the null hypothesis being accepted i.e. that there is no difference in debt midpoint between the eleven regions.

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
E Anglia	75	5565	74.2	16007.46
Yorks&Humber	75	9055	120.7333	31941.01
Wales	75	6990	93.2	17499.76
W Midlands	75	4035	53.8	14603.95
South West	75	4160	55.46667	16298.09
South East	75	6340	84.53333	28367.68
Scotland	75	4620	61.6	14381.19
North West	75	5095	67.93333	16927.77
North	75	5620	74.93333	12936.82
Greater London	75	7345	97.93333	26658.17
E Midlands	75	7325	97.66667	25709.01

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	323936.0606	10	32393.61	1.609941	0.09905	1.842318
Within Groups	16378486.67	814	20120.99			
Total	16702422.73	824				

Table 6

Discussion

(A detailed Discussion was not required for the original assignment, so this is rather brief. If written for an article, the 'Discussion' should be a longer section which comparing the outcomes of analysis with reported research)

In conclusion there appears to be a positive relationship between savings and income and savings and house value i.e. as income level or house value goes up so do both monthly savings and total savings. Age does have some positive correlation with total savings but not with monthly savings. In general savings levels are skewed to the lower end of the range. In order to give these results some context it would be helpful to compare this data with the results of the survey from other years and establish if there are any trends. It could be argued however, that the fact the majority of respondents saved just £12.50 or less per month is not a good sign of economic prosperity.

There appears to be a positive relationship between income and qualification level and that relationship is statistically significant. However, with regards to a relationship between income and gender the two tests used (t-test with the income midpoint (fihhyr_a) data set and chi square test with the income category (fihhyr2) data set) resulted in the acceptance and rejection of the same null hypothesis. This may have been due to the reduced grouping of the income bands in the chi-square test.

With regards to debt I focused on the last unsecured loan repayment. This is only one part of the debt picture. Based on the mean calculation there appeared to be some regional disparity though the single factor Anova result showed that this was not statistically significant.

Finally, it should be noted that there are still a number of unknown factors such as sampling method and a number of assumptions that had to be made about the data e.g. does income refer to individual income or household income? Furthermore, the data is subjective, i.e. it is the opinion of the respondent. Midpoints had to be used rather than actual numerical data for the statistical tests which may also have had an impact on the results. It would be recommended that other appropriate survey data are used to check against the conclusions made in this paper.

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