

Thesis progress report 24-5-2020

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What have I been doing since our last meeting?

I have been looking for a proper analysis method, as the ones I had previously used did not work well with the type of data (mostly ordinal/categorical) that my dataset has. After much trial and error with different types I settled on using a two-type approach: linear regression to test the first model for mental accounting proxies on payment methods, and ordered logistic regression for the significant results in the first test + the addition of demographics/covariates. By moving to ordered logistic regression with the reduced model I can see how well the reduced model works for each payment method, and which levels of the independent variables significantly affect the payment methods. This works well for the most part, though sometimes produces odd results (like the internet reduced model not having any significant factors in the reduced model) which I want to investigate more.

I have also gone over the importance of my hypotheses again, and decided to drop H4 & H5. I originally intended these to tie the results from the first three hypotheses together, but from your feedback I gathered that each hypothesis would need its own full tests. If I were to keep H4&H5 they would largely repeat the results found in H1-H3, and thus would not add a lot of new findings. If I were to describe the current setup I see for H1-H3 it would be the following:

H1: Show effects payment method -> mental accounting (related to pain of paying)

H2: Show how pain of paying(/mental accounting) is affected by purchase complexity (explaining how certain purchases affect pain of paying)

H3: Show how financial issues are made more severe by paing of paying(/mental accounting)

This setup covers the entire model of my three main concepts, and spends some time showing the impact of pain of paying. I might have to change/broaden the context of H2 a bit as I am currently having issues selecting variables for this and showing results.

Analysis results - H1

My first step for H1 is to select the payment variables and the mental accounting proxies to use. My selection of payment methods is as follows:

- pin2 (frequency of use of the pin payment method)
- nfc2 (frequency of use of the nfc payment method)
 - NFC (Near Field Communication) is the use of an NFC chip in a debit/credit card or smartphone to pay. This is commonly referred to as “contactless payment”
- smart (frequency of use of application payment method)
 - Applications in this sense are applications for smartphones to transfer money from one bank account to another (think of applications of banks, Tikkie or PayPal)

- intern (frequency of use of the internet as payment method)
 - Using the internet in this sense means going to your banks' webpage, use your log-in and manage your account from there. Another example is payment via online ordering through businesses like Bol.com or Amazon.

For the mental accounting proxies I looked at variables in the dataset that could be used as explanatory variables for purchasing behaviour. This was focused on attitudes towards concepts related to purchasing such as savings, debt, risk avoidance and budgeting skills.

- zinvol (measure of motivation to save money)
 - 4-point scale on whether the respondent thinks that saving money is useful.
- opzij (measure of actual actions toward savings)
 - yes/no answer to the question “have you saved money in the past 12 months?”
- beschryf (measure of risk avoidance/seeking behaviour)
 - 5-point scale where 1 is “taking few risks” and 5 is “taking considerable risks”
- uitgeven (measure of impulsivity spending)
 - 7-point scale where 1 signifies spending your money immediately, and 7 signifies saving as much as possible.
- bijhoud (measure of budgeting skills)
 - 5-point scale asking respondents how well they keep track of their expenditures
- loan2 (measure of loan availability)
 - yes/no answer to the question “can you obtain a loan right now?”
- loan3 (measure of ability to pay back debt)
 - yes/no answer to the question “have you ever had debt assistance?”
- hoevspa (measure of level of savings)
 - 7-point scale of amount of savings respondents have

A note to make on these variables is that most are self-estimates of respondents, with no objective measure. I assume that people were truthful in answering the questions and thus these measures can be used. They can not be seen as objective facts for causality, however.

The first analysis of these proxies was done by a linear regression, to select which of these proxies explained the usage of the payment method the best.

```
##
## Call:
## lm(formula = pin2 ~ zinvol + opzij + beschryf + uitgeven + bijhoud +
##      loan2 + loan3 + hoevspa, data = nH1set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.5136 -0.4237  0.4307  0.5774  0.8883
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.556268   0.422819   8.411  <2e-16 ***
```

```
## zinvol      0.020603   0.034982   0.589   0.5561
## opzij      0.005812   0.068030   0.085   0.9319
## beschryf   0.005201   0.027737   0.188   0.8513
## uitgeven  -0.033977   0.026425  -1.286   0.1989
## bijhoud    0.014208   0.026927   0.528   0.5979
## loan2     -0.063255   0.027108  -2.333   0.0199 *
## loan3     -0.038169   0.187178  -0.204   0.8385
## hoevspa    0.063461   0.026441   2.400   0.0166 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.735 on 723 degrees of freedom
## (1232 observations deleted due to missingness)
## Multiple R-squared:  0.02327,    Adjusted R-squared:  0.01247
## F-statistic: 2.154 on 8 and 723 DF,  p-value: 0.02912
```

This model shows that only the variables “loan2” and “hoevspa” are significant in explaining pin usage, with the other variables not being anywhere close to significance.

```
##
## Call:
## lm(formula = nfc2 ~ zinvol + opzij + beschryf + uitgeven + bijhoud +
##       loan2 + loan3 + hoevspa, data = nH1set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.1342 -0.6818  0.3335  0.8435  2.3553
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.00027    0.76914   7.801 2.97e-14 ***
## zinvol       0.03024    0.06532   0.463  0.64359
## opzij      -0.21042    0.13002  -1.618  0.10614
## beschryf   -0.01625    0.05332  -0.305  0.76066
## uitgeven   -0.16647    0.05118  -3.252  0.00121 **
## bijhoud    -0.12879    0.05140  -2.506  0.01250 *
## loan2      -0.09982    0.05191  -1.923  0.05496 .
## loan3      -0.51786    0.33920  -1.527  0.12739
## hoevspa     0.11862    0.04946   2.398  0.01679 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.242 on 566 degrees of freedom
## (1389 observations deleted due to missingness)
## Multiple R-squared:  0.06204,    Adjusted R-squared:  0.04878
## F-statistic: 4.679 on 8 and 566 DF,  p-value: 1.458e-05
```

For nfc usage the variables uitgeven, bijhoud, loan2 and hoevspa are significant, and will form the base of further analysis.

```
##
## Call:
## lm(formula = smart ~ zinvol + opzij + beschryf + uitgeven + bijhoud +
```

```
##      loan2 + loan3 + hoevspa, data = nH1set)
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -2.3969 -1.7135  0.1224  1.5586  3.0075
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.05561    0.95254   5.308 1.48e-07 ***
## zinvol      -0.02594    0.07854  -0.330  0.7413
## opzij       -0.38295    0.15271  -2.508  0.0124 *
## beschryf     0.03993    0.06240   0.640  0.5224
## uitgeven    -0.06754    0.05953  -1.135  0.2569
## bijhoud     0.09653    0.06071   1.590  0.1123
## loan2       -0.15055    0.06078  -2.477  0.0135 *
## loan3       -0.78952    0.42216  -1.870  0.0619 .
## hoevspa      0.03975    0.05953   0.668  0.5045
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.658 on 727 degrees of freedom
## (1228 observations deleted due to missingness)
## Multiple R-squared:  0.03153,    Adjusted R-squared:  0.02087
## F-statistic: 2.958 on 8 and 727 DF,  p-value: 0.002904
```

Using applications seems best explained by opzij, loan2 and loan3.

```
##
## Call:
## lm(formula = intern ~ zinvol + opzij + beschryf + uitgeven +
##      bijhoud + loan2 + loan3 + hoevspa, data = nH1set)
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -3.1973 -0.7857  0.0516  0.8834  1.4629
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.82278    0.55450   5.091 4.55e-07 ***
## zinvol      -0.04442    0.04573  -0.971  0.33169
## opzij       0.17316    0.08890   1.948  0.05182 .
## beschryf     0.02525    0.03635   0.695  0.48738
## uitgeven     0.02278    0.03466   0.657  0.51128
## bijhoud     0.09626    0.03534   2.724  0.00661 **
## loan2       -0.04678    0.03540  -1.322  0.18672
## loan3       0.27636    0.24575   1.125  0.26115
## hoevspa      0.02897    0.03466   0.836  0.40344
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9651 on 726 degrees of freedom
## (1229 observations deleted due to missingness)
## Multiple R-squared:  0.02545,    Adjusted R-squared:  0.01471
## F-statistic: 2.37 on 8 and 726 DF,  p-value: 0.016
```

Lastly, internet usage seems to be best explained by just opzij and bijhoud variables. Though this model shows some issues with further testing, so I might have to find a different model for this.

Further testing PIN with POLR and covariates

To clearly see which levels of the ordinal & categorical variables are most important in explaining payment method usage, I looked towards the polr function. This allows me to analyze which levels specifically are significant in explaining the choice for certain payment methods, and how this is affected by covariates.

As an example to visualize this on the base model for PIN usage:

##	Value	Std. Error	t value
## loan2agree	-0.3363407	0.1327979	-2.5327267
## loan2agree nor disagree	-0.5948428	0.1437349	-4.1384712
## loan2disagree	-0.5249718	0.1872338	-2.8038298
## loan2totally disagree	-0.9516915	0.2343759	-4.0605353
## hoevspabetween 1,500 and 5,000 Euro	0.1062348	0.1138791	0.9328734
## hoevspabetween 5,000 and 12,500 Euro	0.4402243	0.1404827	3.1336553
## hoevspabetween 12,500 and 20,000 Euro	0.5478354	0.2360080	2.3212581
## hoevspabetween 20,000 and 37,500 Euro	0.2082423	0.3682003	0.5655680
## hoevspabetween 37,500 and 75,000 Euro	0.6942721	0.6873282	1.0101028
## hoevspa75,000 Euro or more	0.9827482	0.6787718	1.4478331
## never or very rarely every now and then	-4.3255080	0.2317926	-18.6611175
## every now and then often	-1.9633488	0.1485614	-13.2157425
## often very often	-0.3492451	0.1394025	-2.5052997
##	p value		
## loan2agree	1.131791e-02		
## loan2agree nor disagree	3.496278e-05		
## loan2disagree	5.049956e-03		
## loan2totally disagree	4.896034e-05		
## hoevspabetween 1,500 and 5,000 Euro	3.508853e-01		
## hoevspabetween 5,000 and 12,500 Euro	1.726435e-03		
## hoevspabetween 12,500 and 20,000 Euro	2.027292e-02		
## hoevspabetween 20,000 and 37,500 Euro	5.716875e-01		
## hoevspabetween 37,500 and 75,000 Euro	3.124460e-01		
## hoevspa75,000 Euro or more	1.476637e-01		
## never or very rarely every now and then	1.025637e-77		
## every now and then often	7.118044e-40		
## often very often	1.223477e-02		

The p-values are generated by extra code, as the default function only shows t-values. The conversion is done with the normal assumptions. This shows us that Loan2 values are all significant, and becomes increasingly negative in value as people consider themselves less likely to be able to obtain a loan. Thus, as people become less confident in their own financial stability, they tend to use pin less. The opposite effect can be seen in the hoevspa variable for the levels 5k-12.5k and 12.5k-20k, where these significant variables become increasingly positives. Thus, more savings at these levels increase pin usage. This suggests that as people become more financially secure, they use pin more.

The first covariate to be added is age. In data exploration I found some differing effects per age group for usage of the different payment methods. I decided to divide age into three different groups (young adults 18-30, adults 30-64, pensioners 65+) to better show their results. I will show three tests with each of them containing two of these variables, as adding them all would force an exclusion due to perfect collinearity. I want to refactor this age group again to make it into one variable, that should show better results than having 3 separate tests.

	Value	Std. Error	t value
## loan2agree	-0.3436216	0.1337001	-2.5700926
## loan2agree nor disagree	-0.5782059	0.1451838	-3.9825794
## loan2disagree	-0.5786604	0.1888243	-3.0645443
## loan2totally disagree	-0.9564627	0.2358622	-4.0551757
## hoevspabetween 1,500 and 5,000 Euro	0.1257815	0.1147764	1.0958821
## hoevspabetween 5,000 and 12,500 Euro	0.4734934	0.1413020	3.3509325
## hoevspabetween 12,500 and 20,000 Euro	0.5591203	0.2372536	2.3566359
## hoevspabetween 20,000 and 37,500 Euro	0.2579568	0.3697391	0.6976725
## hoevspabetween 37,500 and 75,000 Euro	0.7313496	0.6900510	1.0598487
## hoevspa75,000 Euro or more	1.1114603	0.6825231	1.6284582
## youngadultyes	0.9743290	0.1970548	4.9444579
## adultyes	0.2153197	0.1018838	2.1133843
## never or very rarely every now and then	-4.1406562	0.2420498	-17.1066287
## every now and then often	-1.7729300	0.1649888	-10.7457570
## often very often	-0.1377167	0.1579663	-0.8718103
##	p value		
## loan2agree	1.016713e-02		
## loan2agree nor disagree	6.817134e-05		
## loan2disagree	2.180019e-03		
## loan2totally disagree	5.009664e-05		
## hoevspabetween 1,500 and 5,000 Euro	2.731304e-01		
## hoevspabetween 5,000 and 12,500 Euro	8.053993e-04		
## hoevspabetween 12,500 and 20,000 Euro	1.844132e-02		
## hoevspabetween 20,000 and 37,500 Euro	4.853820e-01		
## hoevspabetween 37,500 and 75,000 Euro	2.892134e-01		
## hoevspa75,000 Euro or more	1.034278e-01		
## youngadultyes	7.635604e-07		
## adultyes	3.456789e-02		
## never or very rarely every now and then	1.324469e-65		
## every now and then often	6.205079e-27		
## often very often	3.833119e-01		

This first group shows that being a young adult or adult is significant in increasing pin usage, though the estimate for young adults is much higher.

	Value	Std. Error	t value
## loan2agree	-0.3435727	0.1336997	-2.5697350
## loan2agree nor disagree	-0.5781416	0.1451834	-3.9821457
## loan2disagree	-0.5785330	0.1888246	-3.0638650
## loan2totally disagree	-0.9563227	0.2358624	-4.0545794
## hoevspabetween 1,500 and 5,000 Euro	0.1258580	0.1147764	1.0965496
## hoevspabetween 5,000 and 12,500 Euro	0.4735789	0.1413021	3.3515360
## hoevspabetween 12,500 and 20,000 Euro	0.5592512	0.2372551	2.3571722
## hoevspabetween 20,000 and 37,500 Euro	0.2579703	0.3697359	0.6977151
## hoevspabetween 37,500 and 75,000 Euro	0.7313529	0.6900359	1.0598765
## hoevspa75,000 Euro or more	1.1115931	0.6825346	1.6286253
## youngadultyes	0.7589634	0.1923559	3.9456209
## pensioneryes	-0.2153250	0.1018839	-2.1134345
## never or very rarely every now and then	-4.3559143	0.2346527	-18.5632415
## every now and then often	-1.9881569	0.1527171	-13.0185608
## often very often	-0.3529283	0.1435828	-2.4580125
##	p value		
## loan2agree	1.017764e-02		

```

## loan2agree nor disagree      6.829590e-05
## loan2disagree                2.184975e-03
## loan2totally disagree        5.022459e-05
## hoevspabetween 1,500 and 5,000 Euro  2.728383e-01
## hoevspabetween 5,000 and 12,500 Euro  8.036458e-04
## hoevspabetween 12,500 and 20,000 Euro  1.841470e-02
## hoevspabetween 20,000 and 37,500 Euro  4.853554e-01
## hoevspabetween 37,500 and 75,000 Euro  2.892008e-01
## hoevspa75,000 Euro or more  1.033924e-01
## youngadultyes                7.959344e-05
## pensioneryes                 3.456360e-02
## never or very rarely|every now and then 6.374012e-77
## every now and then|often      9.596259e-39
## often|very often              1.397083e-02

```

Putting young adults and pensioners in the model together shows both significant, with young adults retaining their positive estimate and pensioners showing a negative estimate. This makes sense as pensioners are more likely to stick with cash payments.

	Value	Std. Error	t value
## loan2agree	-0.3435705	0.1336995	-2.5697226
## loan2agree nor disagree	-0.5781424	0.1451831	-3.9821599
## loan2disagree	-0.5785436	0.1888241	-3.0639294
## loan2totally disagree	-0.9563118	0.2358617	-4.0545452
## hoevspabetween 1,500 and 5,000 Euro	0.1258526	0.1147761	1.0965053
## hoevspabetween 5,000 and 12,500 Euro	0.4735790	0.1413018	3.3515418
## hoevspabetween 12,500 and 20,000 Euro	0.5592571	0.2372551	2.3571971
## hoevspabetween 20,000 and 37,500 Euro	0.2578426	0.3697295	0.6973816
## hoevspabetween 37,500 and 75,000 Euro	0.7315963	0.6900731	1.0601722
## hoevspa75,000 Euro or more	1.1115189	0.6825227	1.6285451
## pensioneryes	-0.9743127	0.1970542	-4.9443884
## adultyes	-0.7589932	0.1923566	-3.9457606
## never or very rarely every now and then	-5.1148502	0.2951164	-17.3316393
## every now and then often	-2.7471182	0.2344405	-11.7177630
## often very often	-1.1119234	0.2260101	-4.9197949
##	p value		
## loan2agree	1.017800e-02		
## loan2agree nor disagree	6.829181e-05		
## loan2disagree	2.184505e-03		
## loan2totally disagree	5.023195e-05		
## hoevspabetween 1,500 and 5,000 Euro	2.728577e-01		
## hoevspabetween 5,000 and 12,500 Euro	8.036290e-04		
## hoevspabetween 12,500 and 20,000 Euro	1.841347e-02		
## hoevspabetween 20,000 and 37,500 Euro	4.855640e-01		
## hoevspabetween 37,500 and 75,000 Euro	2.890662e-01		
## hoevspa75,000 Euro or more	1.034094e-01		
## pensioneryes	7.638330e-07		
## adultyes	7.954705e-05		
## never or very rarely every now and then	2.714789e-67		
## every now and then often	1.033655e-31		
## often very often	8.663494e-07		

Interestingly here when both adults and pensioners are added to the model, both are significant and negative. Not sure how to explain this. Would hopefully be solved by the refactoring mentioned earlier.

The next test for covariates is based on social security receivers, as these groups showed differences in payment method usage in the data exploration. The variables tested are is22 (WAO/WIA - insurance for lost work income due to illness), is29 (Zorgtoeslag - help from the government to pay your health insurance if you are below a certain level of income), is210 (Child support) and is211 (Child-bound budget, a specialized form of child support).

##	Value	Std. Error	t value
## loan2agree	-0.31926066	0.1332245	-2.3964118
## loan2agree nor disagree	-0.55237375	0.1448613	-3.8131208
## loan2disagree	-0.43932264	0.1915395	-2.2936403
## loan2totally disagree	-0.85872239	0.2380523	-3.6072848
## hoevspabetween 1,500 and 5,000 Euro	0.05929252	0.1169357	0.5070524
## hoevspabetween 5,000 and 12,500 Euro	0.38810698	0.1440180	2.6948510
## hoevspabetween 12,500 and 20,000 Euro	0.43360646	0.2405469	1.8025858
## hoevspabetween 20,000 and 37,500 Euro	0.13359393	0.3716174	0.3594932
## hoevspabetween 37,500 and 75,000 Euro	0.65029830	0.6893721	0.9433198
## hoevspa75,000 Euro or more	0.94430922	0.6798015	1.3890955
## is22No	0.03549475	0.2178843	0.1629064
## is29No	0.21194358	0.1307033	1.6215620
## is210No	-0.58344665	0.2329482	-2.5046197
## is211No	-0.05656968	0.2418760	-0.2338788
## never or very rarely every now and then	-4.73946617	0.4254928	-11.1387702
## every now and then often	-2.37416747	0.3865304	-6.1422529
## often very often	-0.75422624	0.3826303	-1.9711617
##	p value		
## loan2agree	1.655648e-02		
## loan2agree nor disagree	1.372230e-04		
## loan2disagree	2.181117e-02		
## loan2totally disagree	3.094180e-04		
## hoevspabetween 1,500 and 5,000 Euro	6.121180e-01		
## hoevspabetween 5,000 and 12,500 Euro	7.042011e-03		
## hoevspabetween 12,500 and 20,000 Euro	7.145328e-02		
## hoevspabetween 20,000 and 37,500 Euro	7.192262e-01		
## hoevspabetween 37,500 and 75,000 Euro	3.455174e-01		
## hoevspa75,000 Euro or more	1.648037e-01		
## is22No	8.705921e-01		
## is29No	1.048972e-01		
## is210No	1.225831e-02		
## is211No	8.150791e-01		
## never or very rarely every now and then	8.123327e-29		
## every now and then often	8.135917e-10		
## often very often	4.870538e-02		

The only version of social security which is significant is variable is210, which refers to child support. People who do not receive child support seem to make less use of pin.

The next test looks at the level of people's taxable income.

##	Value	Std. Error	t value
## loan2agree	-0.41956717	2.405855e-01	-1.743942e+00
## loan2agree nor disagree	-0.55194750	2.597700e-01	-2.124755e+00
## loan2disagree	-0.73724196	3.351481e-01	-2.199750e+00
## loan2totally disagree	-0.77435104	4.304196e-01	-1.799061e+00
## hoevspabetween 1,500 and 5,000 Euro	-0.35869072	2.025166e-01	-1.771167e+00

## hoevspabetween 5,000 and 12,500 Euro	0.24742311	2.552687e-01	9.692654e-01
## hoevspabetween 12,500 and 20,000 Euro	0.11765247	4.454290e-01	2.641329e-01
## hoevspabetween 20,000 and 37,500 Euro	-0.43839890	6.906279e-01	-6.347830e-01
## hoevspabetween 37,500 and 75,000 Euro	14.45750410	2.282594e-08	6.333805e+08
## hoevspa75,000 Euro or more	-0.50465934	9.817789e-01	-5.140254e-01
## in20Less than 2,500 euro	0.64975295	4.301214e-01	1.510627e+00
## in202,500 - 5,000 euro	-0.11942548	7.374984e-01	-1.619332e-01
## in205,000 - 10,000 euro	0.06630491	5.680750e-01	1.167186e-01
## in2010,000 - 15,000 euro	-0.23844124	3.462347e-01	-6.886694e-01
## in2015,000 - 20,000 euro	0.32161485	3.586082e-01	8.968419e-01
## in2020,000 - 30,000 euro	0.16855767	2.592525e-01	6.501681e-01
## in2030,000 - 40,000 euro	-0.08970529	2.628737e-01	-3.412487e-01
## in2040,000 - 50,000 euro	0.43891883	3.226570e-01	1.360326e+00
## in2050,000 - 75,000 euro	1.14438296	4.236234e-01	2.701416e+00
## in2075,000 or more	0.52444355	5.594403e-01	9.374434e-01
## never or very rarely every now and then	-4.64792536	4.576869e-01	-1.015525e+01
## every now and then often	-2.08969888	3.091166e-01	-6.760229e+00
## often very often	-0.44143405	2.944969e-01	-1.498943e+00
##	p value		
## loan2agree	8.116922e-02		
## loan2agree nor disagree	3.360708e-02		
## loan2disagree	2.782465e-02		
## loan2totally disagree	7.200906e-02		
## hoevspabetween 1,500 and 5,000 Euro	7.653295e-02		
## hoevspabetween 5,000 and 12,500 Euro	3.324128e-01		
## hoevspabetween 12,500 and 20,000 Euro	7.916775e-01		
## hoevspabetween 20,000 and 37,500 Euro	5.255699e-01		
## hoevspabetween 37,500 and 75,000 Euro	0.000000e+00		
## hoevspa75,000 Euro or more	6.072342e-01		
## in20Less than 2,500 euro	1.308836e-01		
## in202,500 - 5,000 euro	8.713584e-01		
## in205,000 - 10,000 euro	9.070831e-01		
## in2010,000 - 15,000 euro	4.910314e-01		
## in2015,000 - 20,000 euro	3.698033e-01		
## in2020,000 - 30,000 euro	5.155837e-01		
## in2030,000 - 40,000 euro	7.329164e-01		
## in2040,000 - 50,000 euro	1.737266e-01		
## in2050,000 - 75,000 euro	6.904496e-03		
## in2075,000 or more	3.485305e-01		
## never or very rarely every now and then	3.140037e-24		
## every now and then often	1.377734e-11		
## often very often	1.338885e-01		

This result shows that only one bracket of taxable income heavily affects pin usage. The 50k-75k level is significant with a large positive value, suggesting that a higher taxable income results in more pin usage. This does seem to make sense, as a higher taxable income means (likely) more financial stability). This will be compared to the other payment methods to see if the difference is relevant.

##	Value	Std. Error	t value
## loan2agree	-0.39526853	0.1391340	-2.8409204
## loan2agree nor disagree	-0.67204022	0.1497503	-4.4877399
## loan2disagree	-0.62347555	0.1934174	-3.2234725
## loan2totally disagree	-0.89226079	0.2500805	-3.5678942
## hoevspabetween 1,500 and 5,000 Euro	0.09613324	0.1202241	0.7996169

## hoevspabetween 5,000 and 12,500 Euro	0.41694874	0.1476408	2.8240757
## hoevspabetween 12,500 and 20,000 Euro	0.45888268	0.2398678	1.9130650
## hoevspabetween 20,000 and 37,500 Euro	0.15158884	0.3839420	0.3948223
## hoevspabetween 37,500 and 75,000 Euro	0.45538364	0.7025796	0.6481595
## hoevspa75,000 Euro or more	1.14578276	0.8110443	1.4127252
## bet131deficit	0.17044556	0.2363116	0.7212747
## never or very rarely every now and then	-4.41541466	0.2453173	-17.9987870
## every now and then often	-2.07741811	0.1574664	-13.1927706
## often very often	-0.43231843	0.1471469	-2.9380053
##	p value		
## loan2agree	4.498354e-03		
## loan2agree nor disagree	7.198274e-06		
## loan2disagree	1.266465e-03		
## loan2totally disagree	3.598618e-04		
## hoevspabetween 1,500 and 5,000 Euro	4.239328e-01		
## hoevspabetween 5,000 and 12,500 Euro	4.741718e-03		
## hoevspabetween 12,500 and 20,000 Euro	5.573973e-02		
## hoevspabetween 20,000 and 37,500 Euro	6.929741e-01		
## hoevspabetween 37,500 and 75,000 Euro	5.168818e-01		
## hoevspa75,000 Euro or more	1.577365e-01		
## bet131deficit	4.707405e-01		
## never or very rarely every now and then	1.991326e-72		
## every now and then often	9.656977e-40		
## often very often	3.303313e-03		

Adding the variable of having a deficit on your bank account does not seem to be significant, and has a small estimator of increased pin use. This pattern can be looked at for the other payment levels, but the too high significance level means that conclusions drawn from this should receive a healthy dose of skepticism.

Next we will look at people who have different types of banking accounts and investments to see which special type has an effect. The special accounts are: bz03 (savings account), bz12 (investment&growth funds), bz19 (real estate) and bz20 (car ownership).

	Value	Std. Error	t value
##			
## loan2agree	-0.33167372	0.1333001	-2.4881735
## loan2agree nor disagree	-0.57414073	0.1446108	-3.9702486
## loan2disagree	-0.51007967	0.1883553	-2.7080721
## loan2totally disagree	-0.89561947	0.2356846	-3.8000768
## hoevspabetween 1,500 and 5,000 Euro	0.05569409	0.1155229	0.4821041
## hoevspabetween 5,000 and 12,500 Euro	0.37648333	0.1426684	2.6388695
## hoevspabetween 12,500 and 20,000 Euro	0.44255800	0.2395975	1.8470895
## hoevspabetween 20,000 and 37,500 Euro	0.13990517	0.3719757	0.3761137
## hoevspabetween 37,500 and 75,000 Euro	0.63059409	0.6888086	0.9154852
## hoevspa75,000 Euro or more	0.90654499	0.6844057	1.3245724
## bz03yes	0.30577220	0.1221270	2.5037227
## bz12yes	0.17850383	0.1584678	1.1264357
## bz19yes	0.04923113	0.2497747	0.1971021
## bz20yes	0.03228515	0.1071642	0.3012681
## never or very rarely every now and then	-4.07541438	0.2528785	-16.1160941
## every now and then often	-1.70763348	0.1810575	-9.4314403
## often very often	-0.08653999	0.1751962	-0.4939604
##	p value		
## loan2agree	1.284011e-02		
## loan2agree nor disagree	7.179768e-05		

## loan2disagree	6.767532e-03
## loan2totally disagree	1.446512e-04
## hoevspabetween 1,500 and 5,000 Euro	6.297320e-01
## hoevspabetween 5,000 and 12,500 Euro	8.318299e-03
## hoevspabetween 12,500 and 20,000 Euro	6.473418e-02
## hoevspabetween 20,000 and 37,500 Euro	7.068323e-01
## hoevspabetween 37,500 and 75,000 Euro	3.599370e-01
## hoevspa75,000 Euro or more	1.853130e-01
## bz03yes	1.228943e-02
## bz12yes	2.599812e-01
## bz19yes	8.437476e-01
## bz20yes	7.632101e-01
## never or very rarely every now and then	1.966522e-58
## every now and then often	4.044957e-21
## often very often	6.213341e-01

These results show that having a savings account is significant, and leads people to use PIN more. The other special account types do not seem to influence pin usage.

The last test for pin is to see if people who have credit card debt use pin more or less:

##	Value	Std. Error	t value
## loan2agree	-0.33635087	0.1327979	-2.5328017
## loan2agree nor disagree	-0.59456312	0.1437694	-4.1355340
## loan2disagree	-0.52408808	0.1874849	-2.7953608
## loan2totally disagree	-0.95202136	0.2344000	-4.0615237
## hoevspabetween 1,500 and 5,000 Euro	0.10549815	0.1141592	0.9241319
## hoevspabetween 5,000 and 12,500 Euro	0.43953745	0.1406776	3.1244318
## hoevspabetween 12,500 and 20,000 Euro	0.54646240	0.2364775	2.3108435
## hoevspabetween 20,000 and 37,500 Euro	0.20748677	0.3682932	0.5633739
## hoevspabetween 37,500 and 75,000 Euro	0.69300142	0.6875015	1.0079999
## hoevspa75,000 Euro or more	0.98124514	0.6789309	1.4452798
## cred1yes	-0.02122745	0.2287936	-0.0927799
## never or very rarely every now and then	-4.32685575	0.2321995	-18.6342138
## every now and then often	-1.96469758	0.1492615	-13.1627913
## often very often	-0.35059313	0.1401501	-2.5015546
##	p value		
## loan2agree	1.131549e-02		
## loan2agree nor disagree	3.541302e-05		
## loan2disagree	5.184182e-03		
## loan2totally disagree	4.875346e-05		
## hoevspabetween 1,500 and 5,000 Euro	3.554176e-01		
## hoevspabetween 5,000 and 12,500 Euro	1.781488e-03		
## hoevspabetween 12,500 and 20,000 Euro	2.084150e-02		
## hoevspabetween 20,000 and 37,500 Euro	5.731803e-01		
## hoevspabetween 37,500 and 75,000 Euro	3.134545e-01		
## hoevspa75,000 Euro or more	1.483793e-01		
## cred1yes	9.260784e-01		
## never or very rarely every now and then	1.696283e-77		
## every now and then often	1.436781e-39		
## often very often	1.236494e-02		

This does not show a significant result.

Further testing NFC with POLR and covariates

Now the testing process is repeated with NFC usage as dependent variable. Its base model consists of uitgeven, bijhoud, loan2 and hoevspa variables as seen before.

	Value
## uitgeven2	-0.80595344
## uitgeven3	-0.51647925
## uitgeven4	-0.67962353
## uitgeven5	-0.88084960
## uitgeven6	-1.22391577
## uitgeven7 I save as much as possible	-1.52147023
## bijhoudI keep rather bad track of my expenditures	0.26484938
## bijhoudI more or less keep track of my expenditures	-0.12723538
## bijhoudI keep good track of my expenditures	-0.39725135
## bijhoudI keep very good track of my expenditures	-0.47942790
## loan2agree	-0.16872549
## loan2agree nor disagree	-0.34163313
## loan2disagree	-0.42689412
## loan2totally disagree	-0.91360446
## hoevspabetween 1,500 and 5,000 Euro	0.19187260
## hoevspabetween 5,000 and 12,500 Euro	0.26132567
## hoevspabetween 12,500 and 20,000 Euro	0.32225068
## hoevspabetween 20,000 and 37,500 Euro	0.76895948
## hoevspabetween 37,500 and 75,000 Euro	1.05600482
## hoevspa75,000 Euro or more	0.89171886
## never seldom	-3.30603612
## seldom every now and then	-2.54010978
## every now and then often (that is (almost) every week)	-1.58564195
## often (that is (almost) every week) very often (that is (almost) every day)	0.01670283
##	Std. Error
## uitgeven2	0.6580356
## uitgeven3	0.5945175
## uitgeven4	0.5708089
## uitgeven5	0.5643689
## uitgeven6	0.5643484
## uitgeven7 I save as much as possible	0.5723297
## bijhoudI keep rather bad track of my expenditures	0.2887770
## bijhoudI more or less keep track of my expenditures	0.2409807
## bijhoudI keep good track of my expenditures	0.2386726
## bijhoudI keep very good track of my expenditures	0.2525835
## loan2agree	0.1319103
## loan2agree nor disagree	0.1503973
## loan2disagree	0.1902278
## loan2totally disagree	0.2480948
## hoevspabetween 1,500 and 5,000 Euro	0.1257096
## hoevspabetween 5,000 and 12,500 Euro	0.1472762
## hoevspabetween 12,500 and 20,000 Euro	0.2287435
## hoevspabetween 20,000 and 37,500 Euro	0.4282048
## hoevspabetween 37,500 and 75,000 Euro	0.7243365
## hoevspa75,000 Euro or more	0.5624860
## never seldom	0.6041670
## seldom every now and then	0.6015218
## every now and then often (that is (almost) every week)	0.5995576

```

## often (that is (almost) every week)|very often (that is (almost) every day) 0.5975164
## t value
## uitgeven2 -1.22478692
## uitgeven3 -0.86873690
## uitgeven4 -1.19063236
## uitgeven5 -1.56076930
## uitgeven6 -2.16872386
## uitgeven7 I save as much as possible -2.65838088
## bijhoudI keep rather bad track of my expenditures 0.91714152
## bijhoudI more or less keep track of my expenditures -0.52798987
## bijhoudI keep good track of my expenditures -1.66441940
## bijhoudI keep very good track of my expenditures -1.89809669
## loan2agree -1.27909219
## loan2agree nor disagree -2.27153744
## loan2disagree -2.24412095
## loan2totally disagree -3.68248179
## hoevspabetween 1,500 and 5,000 Euro 1.52631651
## hoevspabetween 5,000 and 12,500 Euro 1.77439223
## hoevspabetween 12,500 and 20,000 Euro 1.40878612
## hoevspabetween 20,000 and 37,500 Euro 1.79577503
## hoevspabetween 37,500 and 75,000 Euro 1.45789262
## hoevspa75,000 Euro or more 1.58531735
## never|seldom -5.47205654
## seldom|every now and then -4.22280578
## every now and then|often (that is (almost) every week) -2.64468646
## often (that is (almost) every week)|very often (that is (almost) every day) 0.02795376
## p value
## uitgeven2 2.206555e-01
## uitgeven3 3.849911e-01
## uitgeven4 2.337979e-01
## uitgeven5 1.185782e-01
## uitgeven6 3.010365e-02
## uitgeven7 I save as much as possible 7.851710e-03
## bijhoudI keep rather bad track of my expenditures 3.590685e-01
## bijhoudI more or less keep track of my expenditures 5.975064e-01
## bijhoudI keep good track of my expenditures 9.602865e-02
## bijhoudI keep very good track of my expenditures 5.768335e-02
## loan2agree 2.008646e-01
## loan2agree nor disagree 2.311446e-02
## loan2disagree 2.482462e-02
## loan2totally disagree 2.309744e-04
## hoevspabetween 1,500 and 5,000 Euro 1.269311e-01
## hoevspabetween 5,000 and 12,500 Euro 7.599829e-02
## hoevspabetween 12,500 and 20,000 Euro 1.588984e-01
## hoevspabetween 20,000 and 37,500 Euro 7.253030e-02
## hoevspabetween 37,500 and 75,000 Euro 1.448701e-01
## hoevspa75,000 Euro or more 1.128942e-01
## never|seldom 4.448429e-08
## seldom|every now and then 2.412797e-05
## every now and then|often (that is (almost) every week) 8.176664e-03
## often (that is (almost) every week)|very often (that is (almost) every day) 9.776990e-01

```

We see from the base model that the higher levels of the uitgeven variable (which indicate a preference of saving over impulsive spending) is significant, reducing people's NFC usage. A similar yet smaller effect is

seen for people who keep good track of their expenditures, and for people who estimate that they cannot obtain a loan. An increase of NFC usage is seen for people who have saved between 20k and 37.5k. This is the only significant level of the hoevspa variable, though the trend is clear for all levels: more savings leads to more nfc usage.

Adding the age covariates in the same way as with PIN gives the following results:

	Value
## uitgeven2	-0.7072045
## uitgeven3	-0.5005328
## uitgeven4	-0.5679256
## uitgeven5	-0.7141786
## uitgeven6	-0.9918021
## uitgeven7 I save as much as possible	-1.2906917
## bijhoudI keep rather bad track of my expenditures	0.1180403
## bijhoudI more or less keep track of my expenditures	-0.2299397
## bijhoudI keep good track of my expenditures	-0.4436003
## bijhoudI keep very good track of my expenditures	-0.4974219
## loan2agree	-0.1786922
## loan2agree nor disagree	-0.2916076
## loan2disagree	-0.5184600
## loan2totally disagree	-0.8466170
## hoevspabetween 1,500 and 5,000 Euro	0.1885701
## hoevspabetween 5,000 and 12,500 Euro	0.2622013
## hoevspabetween 12,500 and 20,000 Euro	0.3339329
## hoevspabetween 20,000 and 37,500 Euro	0.8145731
## hoevspabetween 37,500 and 75,000 Euro	1.1369474
## hoevspa75,000 Euro or more	0.9908508
## youngadulthoodyes	1.5982837
## adulthoodyes	0.4832380
## never seldom	-2.8312101
## seldom every now and then	-2.0558850
## every now and then often (that is (almost) every week)	-1.0694749
## often (that is (almost) every week) very often (that is (almost) every day)	0.6112232
##	Std. Error
## uitgeven2	0.6621380
## uitgeven3	0.5982021
## uitgeven4	0.5743335
## uitgeven5	0.5679925
## uitgeven6	0.5682648
## uitgeven7 I save as much as possible	0.5763746
## bijhoudI keep rather bad track of my expenditures	0.2901257
## bijhoudI more or less keep track of my expenditures	0.2409576
## bijhoudI keep good track of my expenditures	0.2386168
## bijhoudI keep very good track of my expenditures	0.2531313
## loan2agree	0.1330705
## loan2agree nor disagree	0.1518982
## loan2disagree	0.1907673
## loan2totally disagree	0.2507598
## hoevspabetween 1,500 and 5,000 Euro	0.1260398
## hoevspabetween 5,000 and 12,500 Euro	0.1472191
## hoevspabetween 12,500 and 20,000 Euro	0.2296093
## hoevspabetween 20,000 and 37,500 Euro	0.4294313
## hoevspabetween 37,500 and 75,000 Euro	0.7421612
## hoevspa75,000 Euro or more	0.5686153

## youngadultyes	0.1953814
## adultyes	0.1105175
## never seldom	0.6128989
## seldom every now and then	0.6106459
## every now and then often (that is (almost) every week)	0.6093608
## often (that is (almost) every week) very often (that is (almost) every day)	0.6085210
##	t value
## uitgeven2	-1.0680621
## uitgeven3	-0.8367287
## uitgeven4	-0.9888429
## uitgeven5	-1.2573734
## uitgeven6	-1.7453167
## uitgeven7 I save as much as possible	-2.2393281
## bijhoudI keep rather bad track of my expenditures	0.4068589
## bijhoudI more or less keep track of my expenditures	-0.9542747
## bijhoudI keep good track of my expenditures	-1.8590487
## bijhoudI keep very good track of my expenditures	-1.9650744
## loan2agree	-1.3428385
## loan2agree nor disagree	-1.9197566
## loan2disagree	-2.7177608
## loan2totally disagree	-3.3762065
## hoevspabetween 1,500 and 5,000 Euro	1.4961156
## hoevspabetween 5,000 and 12,500 Euro	1.7810276
## hoevspabetween 12,500 and 20,000 Euro	1.4543529
## hoevspabetween 20,000 and 37,500 Euro	1.8968646
## hoevspabetween 37,500 and 75,000 Euro	1.5319413
## hoevspa75,000 Euro or more	1.7425681
## youngadultyes	8.1803271
## adultyes	4.3725011
## never seldom	-4.6193754
## seldom every now and then	-3.3667384
## every now and then often (that is (almost) every week)	-1.7550766
## often (that is (almost) every week) very often (that is (almost) every day)	1.0044405
##	p value
## uitgeven2	2.854925e-01
## uitgeven3	4.027451e-01
## uitgeven4	3.227400e-01
## uitgeven5	2.086185e-01
## uitgeven6	8.092975e-02
## uitgeven7 I save as much as possible	2.513458e-02
## bijhoudI keep rather bad track of my expenditures	6.841116e-01
## bijhoudI more or less keep track of my expenditures	3.399446e-01
## bijhoudI keep good track of my expenditures	6.302023e-02
## bijhoudI keep very good track of my expenditures	4.940562e-02
## loan2agree	1.793243e-01
## loan2agree nor disagree	5.488865e-02
## loan2disagree	6.572534e-03
## loan2totally disagree	7.349274e-04
## hoevspabetween 1,500 and 5,000 Euro	1.346235e-01
## hoevspabetween 5,000 and 12,500 Euro	7.490794e-02
## hoevspabetween 12,500 and 20,000 Euro	1.458485e-01
## hoevspabetween 20,000 and 37,500 Euro	5.784582e-02
## hoevspabetween 37,500 and 75,000 Euro	1.255369e-01
## hoevspa75,000 Euro or more	8.140909e-02

## youngadultyes	2.830744e-16
## adultyes	1.228312e-05
## never seldom	3.848970e-06
## seldom every now and then	7.606281e-04
## every now and then often (that is (almost) every week)	7.924621e-02
## often (that is (almost) every week) very often (that is (almost) every day)	3.151663e-01

Adding young adults and adults to the model shows a significant increase in nfc usage when belonging to either of these groups, though the estimate for young adults is much bigger.

##	Value
## uitgeven2	-0.7081799
## uitgeven3	-0.5014645
## uitgeven4	-0.5687770
## uitgeven5	-0.7150739
## uitgeven6	-0.9926855
## uitgeven7 I save as much as possible	-1.2915746
## bijhoudI keep rather bad track of my expenditures	0.1181199
## bijhoudI more or less keep track of my expenditures	-0.2299055
## bijhoudI keep good track of my expenditures	-0.4435773
## bijhoudI keep very good track of my expenditures	-0.4973901
## loan2agree	-0.1786922
## loan2agree nor disagree	-0.2916092
## loan2disagree	-0.5184521
## loan2totally disagree	-0.8466168
## hoevspabetween 1,500 and 5,000 Euro	0.1885670
## hoevspabetween 5,000 and 12,500 Euro	0.2622078
## hoevspabetween 12,500 and 20,000 Euro	0.3339566
## hoevspabetween 20,000 and 37,500 Euro	0.8146024
## hoevspabetween 37,500 and 75,000 Euro	1.1363509
## hoevspa75,000 Euro or more	0.9908527
## youngadultyes	1.1150470
## pensioneryes	-0.4831884
## never seldom	-3.3152688
## seldom every now and then	-2.5399418
## every now and then often (that is (almost) every week)	-1.5535575
## often (that is (almost) every week) very often (that is (almost) every day)	0.1271596
##	Std. Error
## uitgeven2	0.6621602
## uitgeven3	0.5982267
## uitgeven4	0.5743594
## uitgeven5	0.5680186
## uitgeven6	0.5682909
## uitgeven7 I save as much as possible	0.5764005
## bijhoudI keep rather bad track of my expenditures	0.2901260
## bijhoudI more or less keep track of my expenditures	0.2409577
## bijhoudI keep good track of my expenditures	0.2386168
## bijhoudI keep very good track of my expenditures	0.2531315
## loan2agree	0.1330705
## loan2agree nor disagree	0.1518983
## loan2disagree	0.1907673
## loan2totally disagree	0.2507600
## hoevspabetween 1,500 and 5,000 Euro	0.1260398
## hoevspabetween 5,000 and 12,500 Euro	0.1472191

## hoevspabetween 12,500 and 20,000 Euro	0.2296093
## hoevspabetween 20,000 and 37,500 Euro	0.4294317
## hoevspabetween 37,500 and 75,000 Euro	0.7421271
## hoevspa75,000 Euro or more	0.5686151
## youngadultyes	0.1846882
## pensioneryes	0.1105174
## never seldom	0.6086486
## seldom every now and then	0.6060713
## every now and then often (that is (almost) every week)	0.6041038
## often (that is (almost) every week) very often (that is (almost) every day)	0.6021857
##	t value
## uitgeven2	-1.0694995
## uitgeven3	-0.8382516
## uitgeven4	-0.9902806
## uitgeven5	-1.2588917
## uitgeven6	-1.7467911
## uitgeven7 I save as much as possible	-2.2407591
## bijhoudI keep rather bad track of my expenditures	0.4071333
## bijhoudI more or less keep track of my expenditures	-0.9541322
## bijhoudI keep good track of my expenditures	-1.8589523
## bijhoudI keep very good track of my expenditures	-1.9649475
## loan2agree	-1.3428383
## loan2agree nor disagree	-1.9197667
## loan2disagree	-2.7177198
## loan2totally disagree	-3.3762034
## hoevspabetween 1,500 and 5,000 Euro	1.4960908
## hoevspabetween 5,000 and 12,500 Euro	1.7810713
## hoevspabetween 12,500 and 20,000 Euro	1.4544560
## hoevspabetween 20,000 and 37,500 Euro	1.8969310
## hoevspabetween 37,500 and 75,000 Euro	1.5312079
## hoevspa75,000 Euro or more	1.7425719
## youngadultyes	6.0374558
## pensioneryes	-4.3720565
## never seldom	-5.4469344
## seldom every now and then	-4.1908299
## every now and then often (that is (almost) every week)	-2.5716732
## often (that is (almost) every week) very often (that is (almost) every day)	0.2111635
##	p value
## uitgeven2	2.848447e-01
## uitgeven3	4.018894e-01
## uitgeven4	3.220370e-01
## uitgeven5	2.080694e-01
## uitgeven6	8.067359e-02
## uitgeven7 I save as much as possible	2.504168e-02
## bijhoudI keep rather bad track of my expenditures	6.839101e-01
## bijhoudI more or less keep track of my expenditures	3.400167e-01
## bijhoudI keep good track of my expenditures	6.303390e-02
## bijhoudI keep very good track of my expenditures	4.942032e-02
## loan2agree	1.793243e-01
## loan2agree nor disagree	5.488737e-02
## loan2disagree	6.573348e-03
## loan2totally disagree	7.349358e-04
## hoevspabetween 1,500 and 5,000 Euro	1.346300e-01
## hoevspabetween 5,000 and 12,500 Euro	7.490081e-02

## hoevspabetween 12,500 and 20,000 Euro	1.458199e-01
## hoevspabetween 20,000 and 37,500 Euro	5.783704e-02
## hoevspabetween 37,500 and 75,000 Euro	1.257180e-01
## hoevspa75,000 Euro or more	8.140842e-02
## youngadulthoodyes	1.565630e-09
## pensioneryes	1.230817e-05
## never seldom	5.124537e-08
## seldom every now and then	2.779360e-05
## every now and then often (that is (almost) every week)	1.012084e-02
## often (that is (almost) every week) very often (that is (almost) every day)	8.327597e-01

Showing the difference between young adults and pensioners retains the positive effect for young adults, but also shows a reduced usage when being a pensioner. Both results are significant.

##	Value
## uitgeven2	-0.7075559
## uitgeven3	-0.5008152
## uitgeven4	-0.5681813
## uitgeven5	-0.7144074
## uitgeven6	-0.9920513
## uitgeven7 I save as much as possible	-1.2909459
## bijhoudI keep rather bad track of my expenditures	0.1181058
## bijhoudI more or less keep track of my expenditures	-0.2298968
## bijhoudI keep good track of my expenditures	-0.4435467
## bijhoudI keep very good track of my expenditures	-0.4973890
## loan2agree	-0.1786952
## loan2agree nor disagree	-0.2916178
## loan2disagree	-0.5184467
## loan2totally disagree	-0.8466257
## hoevspabetween 1,500 and 5,000 Euro	0.1885738
## hoevspabetween 5,000 and 12,500 Euro	0.2622074
## hoevspabetween 12,500 and 20,000 Euro	0.3339503
## hoevspabetween 20,000 and 37,500 Euro	0.8146654
## hoevspabetween 37,500 and 75,000 Euro	1.1369328
## hoevspa75,000 Euro or more	0.9909086
## adulthoodyes	-1.1150385
## pensioneryes	-1.5982692
## never seldom	-4.4296691
## seldom every now and then	-3.6543670
## every now and then often (that is (almost) every week)	-2.6679454
## often (that is (almost) every week) very often (that is (almost) every day)	-0.9872505
##	Std. Error
## uitgeven2	0.6621430
## uitgeven3	0.5982079
## uitgeven4	0.5743397
## uitgeven5	0.5679988
## uitgeven6	0.5682711
## uitgeven7 I save as much as possible	0.5763808
## bijhoudI keep rather bad track of my expenditures	0.2901256
## bijhoudI more or less keep track of my expenditures	0.2409573
## bijhoudI keep good track of my expenditures	0.2386165
## bijhoudI keep very good track of my expenditures	0.2531311
## loan2agree	0.1330705
## loan2agree nor disagree	0.1518982

## loan2disagree	0.1907674
## loan2totally disagree	0.2507599
## hoevspabetween 1,500 and 5,000 Euro	0.1260398
## hoevspabetween 5,000 and 12,500 Euro	0.1472191
## hoevspabetween 12,500 and 20,000 Euro	0.2296094
## hoevspabetween 20,000 and 37,500 Euro	0.4294319
## hoevspabetween 37,500 and 75,000 Euro	0.7421621
## hoevspa75,000 Euro or more	0.5686160
## adultyes	0.1846879
## pensioneryes	0.1953813
## never seldom	0.6307706
## seldom every now and then	0.6281473
## every now and then often (that is (almost) every week)	0.6255363
## often (that is (almost) every week) very often (that is (almost) every day)	0.6206642
##	t value
## uitgeven2	-1.0685847
## uitgeven3	-0.8371924
## uitgeven4	-0.9892773
## uitgeven5	-1.2577622
## uitgeven6	-1.7457358
## uitgeven7 I save as much as possible	-2.2397447
## bijhoudI keep rather bad track of my expenditures	0.4070852
## bijhoudI more or less keep track of my expenditures	-0.9540978
## bijhoudI keep good track of my expenditures	-1.8588266
## bijhoudI keep very good track of my expenditures	-1.9649465
## loan2agree	-1.3428611
## loan2agree nor disagree	-1.9198242
## loan2disagree	-2.7176901
## loan2totally disagree	-3.3762404
## hoevspabetween 1,500 and 5,000 Euro	1.4961450
## hoevspabetween 5,000 and 12,500 Euro	1.7810686
## hoevspabetween 12,500 and 20,000 Euro	1.4544278
## hoevspabetween 20,000 and 37,500 Euro	1.8970771
## hoevspabetween 37,500 and 75,000 Euro	1.5319197
## hoevspa75,000 Euro or more	1.7426674
## adultyes	-6.0374213
## pensioneryes	-8.1802571
## never seldom	-7.0226310
## seldom every now and then	-5.8176914
## every now and then often (that is (almost) every week)	-4.2650528
## often (that is (almost) every week) very often (that is (almost) every day)	-1.5906354
##	p value
## uitgeven2	2.852569e-01
## uitgeven3	4.024844e-01
## uitgeven4	3.225275e-01
## uitgeven5	2.084778e-01
## uitgeven6	8.085686e-02
## uitgeven7 I save as much as possible	2.510750e-02
## bijhoudI keep rather bad track of my expenditures	6.839454e-01
## bijhoudI more or less keep track of my expenditures	3.400341e-01
## bijhoudI keep good track of my expenditures	6.305172e-02
## bijhoudI keep very good track of my expenditures	4.942043e-02
## loan2agree	1.793170e-01
## loan2agree nor disagree	5.488011e-02

## loan2disagree	6.573939e-03
## loan2totally disagree	7.348369e-04
## hoevspabetween 1,500 and 5,000 Euro	1.346159e-01
## hoevspabetween 5,000 and 12,500 Euro	7.490125e-02
## hoevspabetween 12,500 and 20,000 Euro	1.458277e-01
## hoevspabetween 20,000 and 37,500 Euro	5.781776e-02
## hoevspabetween 37,500 and 75,000 Euro	1.255422e-01
## hoevspa75,000 Euro or more	8.139172e-02
## adultyes	1.565964e-09
## pensioneryes	2.832388e-16
## never seldom	2.177287e-12
## seldom every now and then	5.966591e-09
## every now and then often (that is (almost) every week)	1.998549e-05
## often (that is (almost) every week) very often (that is (almost) every day)	1.116916e-01

Adding adult and pensioner to the model together shows the same effect as with the pin variable, making both variables negative and significant. This supports my initial need for a refactoring of this variable.

Next is the test of social security receivers:

##	Value
## uitgeven2	-0.78512624
## uitgeven3	-0.51396833
## uitgeven4	-0.65210122
## uitgeven5	-0.85623598
## uitgeven6	-1.20282706
## uitgeven7 I save as much as possible	-1.50729990
## bijhoudI keep rather bad track of my expenditures	0.26022953
## bijhoudI more or less keep track of my expenditures	-0.12982536
## bijhoudI keep good track of my expenditures	-0.40454319
## bijhoudI keep very good track of my expenditures	-0.48306201
## loan2agree	-0.15578356
## loan2agree nor disagree	-0.33814093
## loan2disagree	-0.43169819
## loan2totally disagree	-0.91586831
## hoevspabetween 1,500 and 5,000 Euro	0.20048592
## hoevspabetween 5,000 and 12,500 Euro	0.27146880
## hoevspabetween 12,500 and 20,000 Euro	0.31695187
## hoevspabetween 20,000 and 37,500 Euro	0.78023886
## hoevspabetween 37,500 and 75,000 Euro	1.05432180
## hoevspa75,000 Euro or more	0.94973716
## is22No	0.09557000
## is29No	-0.14473483
## is210No	-0.33966662
## is211No	0.04903091
## never seldom	-3.58229290
## seldom every now and then	-2.81564111
## every now and then often (that is (almost) every week)	-1.85889472
## often (that is (almost) every week) very often (that is (almost) every day)	-0.25221312
##	Std. Error
## uitgeven2	0.6577266
## uitgeven3	0.5945663
## uitgeven4	0.5717180
## uitgeven5	0.5650602

## uitgeven6	0.5650004
## uitgeven7 I save as much as possible	0.5727512
## bijhoudI keep rather bad track of my expenditures	0.2890341
## bijhoudI more or less keep track of my expenditures	0.2412160
## bijhoudI keep good track of my expenditures	0.2387467
## bijhoudI keep very good track of my expenditures	0.2525732
## loan2agree	0.1322453
## loan2agree nor disagree	0.1521881
## loan2disagree	0.1944983
## loan2totally disagree	0.2510256
## hoevspabetween 1,500 and 5,000 Euro	0.1282891
## hoevspabetween 5,000 and 12,500 Euro	0.1503412
## hoevspabetween 12,500 and 20,000 Euro	0.2322072
## hoevspabetween 20,000 and 37,500 Euro	0.4300249
## hoevspabetween 37,500 and 75,000 Euro	0.7172245
## hoevspa75,000 Euro or more	0.5640412
## is22No	0.2241219
## is29No	0.1444404
## is210No	0.2086454
## is211No	0.2434100
## never seldom	0.7138816
## seldom every now and then	0.7115075
## every now and then often (that is (almost) every week)	0.7092560
## often (that is (almost) every week) very often (that is (almost) every day)	0.7068897
##	t value
## uitgeven2	-1.1936970
## uitgeven3	-0.8644425
## uitgeven4	-1.1405994
## uitgeven5	-1.5153005
## uitgeven6	-2.1288960
## uitgeven7 I save as much as possible	-2.6316836
## bijhoudI keep rather bad track of my expenditures	0.9003421
## bijhoudI more or less keep track of my expenditures	-0.5382121
## bijhoudI keep good track of my expenditures	-1.6944451
## bijhoudI keep very good track of my expenditures	-1.9125624
## loan2agree	-1.1779898
## loan2agree nor disagree	-2.2218625
## loan2disagree	-2.2195478
## loan2totally disagree	-3.6485062
## hoevspabetween 1,500 and 5,000 Euro	1.5627663
## hoevspabetween 5,000 and 12,500 Euro	1.8056853
## hoevspabetween 12,500 and 20,000 Euro	1.3649529
## hoevspabetween 20,000 and 37,500 Euro	1.8144037
## hoevspabetween 37,500 and 75,000 Euro	1.4700025
## hoevspa75,000 Euro or more	1.6838081
## is22No	0.4264197
## is29No	-1.0020387
## is210No	-1.6279616
## is211No	0.2014334
## never seldom	-5.0180489
## seldom every now and then	-3.9572895
## every now and then often (that is (almost) every week)	-2.6209079
## often (that is (almost) every week) very often (that is (almost) every day)	-0.3567927
##	p value

## uitgeven2	2.325965e-01
## uitgeven3	3.873449e-01
## uitgeven4	2.540367e-01
## uitgeven5	1.296963e-01
## uitgeven6	3.326287e-02
## uitgeven7 I save as much as possible	8.496294e-03
## bijhoudI keep rather bad track of my expenditures	3.679382e-01
## bijhoudI more or less keep track of my expenditures	5.904307e-01
## bijhoudI keep good track of my expenditures	9.018074e-02
## bijhoudI keep very good track of my expenditures	5.580410e-02
## loan2agree	2.388007e-01
## loan2agree nor disagree	2.629260e-02
## loan2disagree	2.644948e-02
## loan2totally disagree	2.637696e-04
## hoevspabetween 1,500 and 5,000 Euro	1.181076e-01
## hoevspabetween 5,000 and 12,500 Euro	7.096751e-02
## hoevspabetween 12,500 and 20,000 Euro	1.722679e-01
## hoevspabetween 20,000 and 37,500 Euro	6.961559e-02
## hoevspabetween 37,500 and 75,000 Euro	1.415611e-01
## hoevspa75,000 Euro or more	9.221876e-02
## is22No	6.698021e-01
## is29No	3.163249e-01
## is210No	1.035330e-01
## is211No	8.403597e-01
## never seldom	5.219889e-07
## seldom every now and then	7.580504e-05
## every now and then often (that is (almost) every week)	8.769596e-03
## often (that is (almost) every week) very often (that is (almost) every day)	7.212470e-01

None of the social security variables have a significant effect for nfc usage.

Next is the check for the special bank accounts & investments:

##	Value
## uitgeven2	-0.85409338
## uitgeven3	-0.53022261
## uitgeven4	-0.70322496
## uitgeven5	-0.87754966
## uitgeven6	-1.20394411
## uitgeven7 I save as much as possible	-1.50978047
## bijhoudI keep rather bad track of my expenditures	0.26958920
## bijhoudI more or less keep track of my expenditures	-0.11050964
## bijhoudI keep good track of my expenditures	-0.37618307
## bijhoudI keep very good track of my expenditures	-0.46405583
## loan2agree	-0.18809434
## loan2agree nor disagree	-0.37041919
## loan2disagree	-0.44828299
## loan2totally disagree	-0.95475006
## hoevspabetween 1,500 and 5,000 Euro	0.19595831
## hoevspabetween 5,000 and 12,500 Euro	0.30103655
## hoevspabetween 12,500 and 20,000 Euro	0.37181897
## hoevspabetween 20,000 and 37,500 Euro	0.88567315
## hoevspabetween 37,500 and 75,000 Euro	1.14053979
## hoevspa75,000 Euro or more	1.04532312

## bz03yes	0.14670718
## bz12yes	-0.25067223
## bz19yes	-0.29476096
## bz20yes	-0.21162386
## never seldom	-3.37203164
## seldom every now and then	-2.60363132
## every now and then often (that is (almost) every week)	-1.64422700
## often (that is (almost) every week) very often (that is (almost) every day)	-0.03293915
##	Std. Error
## uitgeven2	0.6568586
## uitgeven3	0.5944891
## uitgeven4	0.5708681
## uitgeven5	0.5645043
## uitgeven6	0.5646567
## uitgeven7 I save as much as possible	0.5725045
## bijhoudI keep rather bad track of my expenditures	0.2889308
## bijhoudI more or less keep track of my expenditures	0.2407375
## bijhoudI keep good track of my expenditures	0.2384025
## bijhoudI keep very good track of my expenditures	0.2524617
## loan2agree	0.1323739
## loan2agree nor disagree	0.1512131
## loan2disagree	0.1910967
## loan2totally disagree	0.2493350
## hoevspabetween 1,500 and 5,000 Euro	0.1271702
## hoevspabetween 5,000 and 12,500 Euro	0.1499002
## hoevspabetween 12,500 and 20,000 Euro	0.2314590
## hoevspabetween 20,000 and 37,500 Euro	0.4312981
## hoevspabetween 37,500 and 75,000 Euro	0.7329736
## hoevspa75,000 Euro or more	0.5641056
## bz03yes	0.1307710
## bz12yes	0.1557003
## bz19yes	0.2624435
## bz20yes	0.1159157
## never seldom	0.6109545
## seldom every now and then	0.6082564
## every now and then often (that is (almost) every week)	0.6062284
## often (that is (almost) every week) very often (that is (almost) every day)	0.6041257
##	t value
## uitgeven2	-1.30026986
## uitgeven3	-0.89189620
## uitgeven4	-1.23185194
## uitgeven5	-1.55454907
## uitgeven6	-2.13217006
## uitgeven7 I save as much as possible	-2.63715047
## bijhoudI keep rather bad track of my expenditures	0.93305798
## bijhoudI more or less keep track of my expenditures	-0.45904623
## bijhoudI keep good track of my expenditures	-1.57793281
## bijhoudI keep very good track of my expenditures	-1.83812388
## loan2agree	-1.42093271
## loan2agree nor disagree	-2.44965052
## loan2disagree	-2.34584362
## loan2totally disagree	-3.82918647
## hoevspabetween 1,500 and 5,000 Euro	1.54091431
## hoevspabetween 5,000 and 12,500 Euro	2.00824608

## hoevspabetween 12,500 and 20,000 Euro	1.60641424
## hoevspabetween 20,000 and 37,500 Euro	2.05350599
## hoevspabetween 37,500 and 75,000 Euro	1.55604493
## hoevspa75,000 Euro or more	1.85306288
## bz03yes	1.12186296
## bz12yes	-1.60996594
## bz19yes	-1.12314050
## bz20yes	-1.82567059
## never seldom	-5.51928476
## seldom every now and then	-4.28048350
## every now and then often (that is (almost) every week)	-2.71222361
## often (that is (almost) every week) very often (that is (almost) every day)	-0.05452366
##	p value
## uitgeven2	1.935085e-01
## uitgeven3	3.724486e-01
## uitgeven4	2.180044e-01
## uitgeven5	1.200535e-01
## uitgeven6	3.299287e-02
## uitgeven7 I save as much as possible	8.360574e-03
## bijhoudI keep rather bad track of my expenditures	3.507900e-01
## bijhoudI more or less keep track of my expenditures	6.462010e-01
## bijhoudI keep good track of my expenditures	1.145810e-01
## bijhoudI keep very good track of my expenditures	6.604415e-02
## loan2agree	1.553363e-01
## loan2agree nor disagree	1.429949e-02
## loan2disagree	1.898407e-02
## loan2totally disagree	1.285676e-04
## hoevspabetween 1,500 and 5,000 Euro	1.233376e-01
## hoevspabetween 5,000 and 12,500 Euro	4.461715e-02
## hoevspabetween 12,500 and 20,000 Euro	1.081829e-01
## hoevspabetween 20,000 and 37,500 Euro	4.002353e-02
## hoevspabetween 37,500 and 75,000 Euro	1.196974e-01
## hoevspa75,000 Euro or more	6.387335e-02
## bz03yes	2.619207e-01
## bz12yes	1.074053e-01
## bz19yes	2.613778e-01
## bz20yes	6.789990e-02
## never seldom	3.403822e-08
## seldom every now and then	1.864877e-05
## every now and then often (that is (almost) every week)	6.683349e-03
## often (that is (almost) every week) very often (that is (almost) every day)	9.565180e-01

Here we see a significant result for people with car ownership, reducing their likelihood of using nfc. This estimate is quite small, however.

The last check is for people who have a credit card deficit.

##	Value
## uitgeven2	-0.81091054
## uitgeven3	-0.52120103
## uitgeven4	-0.67722205
## uitgeven5	-0.87791201
## uitgeven6	-1.21733345
## uitgeven7 I save as much as possible	-1.51848900

## bijhoudI keep rather bad track of my expenditures	0.27914438
## bijhoudI more or less keep track of my expenditures	-0.11239070
## bijhoudI keep good track of my expenditures	-0.38577105
## bijhoudI keep very good track of my expenditures	-0.46547014
## loan2agree	-0.16892937
## loan2agree nor disagree	-0.34333997
## loan2disagree	-0.43828063
## loan2totally disagree	-0.91147792
## hoevspabetween 1,500 and 5,000 Euro	0.19835599
## hoevspabetween 5,000 and 12,500 Euro	0.26520128
## hoevspabetween 12,500 and 20,000 Euro	0.33222220
## hoevspabetween 20,000 and 37,500 Euro	0.77120428
## hoevspabetween 37,500 and 75,000 Euro	1.06670192
## hoevspa75,000 Euro or more	0.90207404
## cred1yes	0.17305237
## never seldom	-3.28063219
## seldom every now and then	-2.51461059
## every now and then often (that is (almost) every week)	-1.55977194
## often (that is (almost) every week) very often (that is (almost) every day)	0.04297486
##	Std. Error
## uitgeven2	0.6586372
## uitgeven3	0.5948053
## uitgeven4	0.5709253
## uitgeven5	0.5645133
## uitgeven6	0.5645608
## uitgeven7 I save as much as possible	0.5724572
## bijhoudI keep rather bad track of my expenditures	0.2894353
## bijhoudI more or less keep track of my expenditures	0.2418525
## bijhoudI keep good track of my expenditures	0.2391346
## bijhoudI keep very good track of my expenditures	0.2532994
## loan2agree	0.1319380
## loan2agree nor disagree	0.1504234
## loan2disagree	0.1910582
## loan2totally disagree	0.2479806
## hoevspabetween 1,500 and 5,000 Euro	0.1260446
## hoevspabetween 5,000 and 12,500 Euro	0.1474378
## hoevspabetween 12,500 and 20,000 Euro	0.2291992
## hoevspabetween 20,000 and 37,500 Euro	0.4283559
## hoevspabetween 37,500 and 75,000 Euro	0.7246307
## hoevspa75,000 Euro or more	0.5627080
## cred1yes	0.2531874
## never seldom	0.6053234
## seldom every now and then	0.6027107
## every now and then often (that is (almost) every week)	0.6007955
## often (that is (almost) every week) very often (that is (almost) every day)	0.5988332
##	t value
## uitgeven2	-1.23119465
## uitgeven3	-0.87625483
## uitgeven4	-1.18618324
## uitgeven5	-1.55516627
## uitgeven6	-2.15624847
## uitgeven7 I save as much as possible	-2.65258076
## bijhoudI keep rather bad track of my expenditures	0.96444496
## bijhoudI more or less keep track of my expenditures	-0.46470755

## bijhoudI keep good track of my expenditures	-1.61319601
## bijhoudI keep very good track of my expenditures	-1.83762802
## loan2agree	-1.28036961
## loan2agree nor disagree	-2.28248973
## loan2disagree	-2.29396412
## loan2totally disagree	-3.67560141
## hoevspabetween 1,500 and 5,000 Euro	1.57369699
## hoevspabetween 5,000 and 12,500 Euro	1.79873283
## hoevspabetween 12,500 and 20,000 Euro	1.44949115
## hoevspabetween 20,000 and 37,500 Euro	1.80038196
## hoevspabetween 37,500 and 75,000 Euro	1.47206284
## hoevspa75,000 Euro or more	1.60309452
## cred1yes	0.68349508
## never seldom	-5.41963525
## seldom every now and then	-4.17216831
## every now and then often (that is (almost) every week)	-2.59617777
## often (that is (almost) every week) very often (that is (almost) every day)	0.07176432
##	p value
## uitgeven2	2.182501e-01
## uitgeven3	3.808915e-01
## uitgeven4	2.355499e-01
## uitgeven5	1.199065e-01
## uitgeven6	3.106427e-02
## uitgeven7 I save as much as possible	7.987902e-03
## bijhoudI keep rather bad track of my expenditures	3.348229e-01
## bijhoudI more or less keep track of my expenditures	6.421409e-01
## bijhoudI keep good track of my expenditures	1.067019e-01
## bijhoudI keep very good track of my expenditures	6.611724e-02
## loan2agree	2.004152e-01
## loan2agree nor disagree	2.246044e-02
## loan2disagree	2.179256e-02
## loan2totally disagree	2.372898e-04
## hoevspabetween 1,500 and 5,000 Euro	1.155575e-01
## hoevspabetween 5,000 and 12,500 Euro	7.206095e-02
## hoevspabetween 12,500 and 20,000 Euro	1.472005e-01
## hoevspabetween 20,000 and 37,500 Euro	7.180035e-02
## hoevspabetween 37,500 and 75,000 Euro	1.410039e-01
## hoevspa75,000 Euro or more	1.089138e-01
## cred1yes	4.942941e-01
## never seldom	5.972075e-08
## seldom every now and then	3.017146e-05
## every now and then often (that is (almost) every week)	9.426728e-03
## often (that is (almost) every week) very often (that is (almost) every day)	9.427895e-01

This does not seem to provide a significant result.

Further testing smart (applications) with POLR and covariates

The significant variables from the linear model test on applications were opzij, loan2 and loan3.

##	Value	Std. Error	t value
## opzijno	-0.4028106	0.1003953	-4.012246
## loan2agree	-0.4410919	0.1132177	-3.895962

## loan2agree nor disagree	-0.6631170	0.1231155	-5.386135
## loan2disagree	-0.4638688	0.1655311	-2.802306
## loan2totally disagree	-0.5006978	0.2056675	-2.434501
## loan3no	-0.3646722	0.2544997	-1.432898
## no yes, very rarely	-1.0889535	0.2685489	-4.054954
## yes, very rarely yes, every now and then	-0.9714750	0.2682682	-3.621283
## yes, every now and then yes, often	-0.5335965	0.2675702	-1.994230
## yes, often yes, very often	0.4158907	0.2679513	1.552113
##	p value		
## opzijno	6.014374e-05		
## loan2agree	9.780963e-05		
## loan2agree nor disagree	7.198873e-08		
## loan2disagree	5.073880e-03		
## loan2totally disagree	1.491233e-02		
## loan3no	1.518869e-01		
## no yes, very rarely	5.014420e-05		
## yes, very rarely yes, every now and then	2.931460e-04		
## yes, every now and then yes, often	4.612694e-02		
## yes, often yes, very often	1.206352e-01		

In this model, not saving (opzijno) is significant and reduces application usage (seen as too risky?). All levels of loan2 are significant with all of them reducing internet usage too, which seems odd. Loan3 is not significant and it might be better to drop it from this model.

##	Value	Std. Error	t value
## opzijno	-0.38909165	0.09982796	-3.8976218
## loan2Rtotally agree	0.66141335	0.12309880	5.3730282
## loan2Ragree	0.21870071	0.11230276	1.9474206
## loan2Rdisagree	0.21029334	0.16234313	1.2953633
## loan2Rtotally disagree	0.19897815	0.20063536	0.9917402
## no yes, very rarely	-0.06634386	0.09277975	-0.7150684
## yes, very rarely yes, every now and then	0.05092670	0.09273128	0.5491858
## yes, every now and then yes, often	0.48830358	0.09338198	5.2290986
## yes, often yes, very often	1.43748117	0.09917250	14.4947556
##	p value		
## opzijno	9.714196e-05		
## loan2Rtotally agree	7.742523e-08		
## loan2Ragree	5.148433e-02		
## loan2Rdisagree	1.951949e-01		
## loan2Rtotally disagree	3.213243e-01		
## no yes, very rarely	4.745668e-01		
## yes, very rarely yes, every now and then	5.828780e-01		
## yes, every now and then yes, often	1.703385e-07		
## yes, often yes, very often	1.307670e-47		

Dropping loan3 from the model and re-referencing loan2 so it uses the neutral level as reference makes the model a bit more clear. Now only the people who are confident they can obtain a loan show a significant result, which are also positive.

Adding in the age covariates as seen before gives the following results:

##	Value	Std. Error	t value
## opzijno	-0.275790966	0.1034055	-2.66708148
## loan2Rtotally agree	0.658726398	0.1278724	5.15143665

## loan2Ragree	0.155914051	0.1167079	1.33593410
## loan2Rdisagree	-0.006697707	0.1681507	-0.03983157
## loan2Rtotally disagree	0.164148339	0.2053722	0.79927258
## youngadulthoodyes	2.416857158	0.1756260	13.76138924
## adulthoodyes	1.382242615	0.1009738	13.68911608
## no yes, very rarely	0.865052847	0.1164173	7.43062329
## yes, very rarely yes, every now and then	0.998850618	0.1169731	8.53914577
## yes, every now and then yes, often	1.498436357	0.1198826	12.49919538
## yes, often yes, very often	2.559537825	0.1289319	19.85186164
##	p value		
## opzijno	7.651312e-03		
## loan2Rtotally agree	2.584985e-07		
## loan2Ragree	1.815708e-01		
## loan2Rdisagree	9.682274e-01		
## loan2Rtotally disagree	4.241324e-01		
## youngadulthoodyes	4.350851e-43		
## adulthoodyes	1.179352e-42		
## no yes, very rarely	1.080871e-13		
## yes, very rarely yes, every now and then	1.352177e-17		
## yes, every now and then yes, often	7.541067e-36		
## yes, often yes, very often	1.061929e-87		

Adding young adult & adult to the model is heavily significant, and both have a very big positive estimate. Age group seems to be very important to explain usage of applications here.

##	Value	Std. Error	t value
## opzijno	-0.275799941	0.1034054	-2.66717255
## loan2Rtotally agree	0.658717926	0.1278721	5.15138114
## loan2Ragree	0.155914246	0.1167076	1.33593867
## loan2Rdisagree	-0.006668702	0.1681501	-0.03965921
## loan2Rtotally disagree	0.164108168	0.2053725	0.79907561
## youngadulthoodyes	1.034575326	0.1620341	6.38492294
## pensioneryes	-1.382205305	0.1009735	-13.68879681
## no yes, very rarely	-0.517179194	0.1054006	-4.90679592
## yes, very rarely yes, every now and then	-0.383371930	0.1050104	-3.65080102
## yes, every now and then yes, often	0.116202291	0.1045709	1.11122920
## yes, often yes, very often	1.177301715	0.1093540	10.76597137
##	p value		
## opzijno	7.649239e-03		
## loan2Rtotally agree	2.585751e-07		
## loan2Ragree	1.815693e-01		
## loan2Rdisagree	9.683648e-01		
## loan2Rtotally disagree	4.242466e-01		
## youngadulthoodyes	1.714838e-10		
## pensioneryes	1.184545e-42		
## no yes, very rarely	9.257627e-07		
## yes, very rarely yes, every now and then	2.614237e-04		
## yes, every now and then yes, often	2.664697e-01		
## yes, often yes, very often	4.983323e-27		

Seeing the comparison between young adults and pensioners further reinforces the idea that age group is important, both being very significant and having large positive and negative (respectively) estimates.

##	Value	Std. Error	t value
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## opzijno	-0.275788898	0.1034051	-2.6670718
## loan2Rtotally agree	0.658719053	0.1278719	5.1513968
## loan2Ragree	0.155924199	0.1167074	1.3360264
## loan2Rdisagree	-0.006687328	0.1681501	-0.0397700
## loan2Rtotally disagree	0.164122547	0.2053719	0.7991480
## adultyes	-1.034593575	0.1620344	-6.3850227
## pensioneryes	-2.416789774	0.1756252	-13.7610650
## no yes, very rarely	-1.551768748	0.1756399	-8.8349453
## yes, very rarely yes, every now and then	-1.417964930	0.1751064	-8.0977315
## yes, every now and then yes, often	-0.918399654	0.1733483	-5.2980031
## yes, often yes, very often	0.142695946	0.1716864	0.8311429
##	p value		
## opzijno	7.651533e-03		
## loan2Rtotally agree	2.585535e-07		
## loan2Ragree	1.815406e-01		
## loan2Rdisagree	9.682765e-01		
## loan2Rtotally disagree	4.242046e-01		
## adultyes	1.713720e-10		
## pensioneryes	4.370407e-43		
## no yes, very rarely	1.001473e-18		
## yes, very rarely yes, every now and then	5.599348e-16		
## yes, every now and then yes, often	1.170760e-07		
## yes, often yes, very often	4.058929e-01		

Here we see the same effect as with the previous payment methods. Refactoring of this variable is still needed.

Continuing with the social security covariates:

	Value	Std. Error	t value
## opzijno	-0.36381166	0.1008609	-3.6070640
## loan2Rtotally agree	0.63705318	0.1253249	5.0832120
## loan2Ragree	0.21427798	0.1134398	1.8889130
## loan2Rdisagree	0.23532435	0.1650923	1.4254111
## loan2Rtotally disagree	0.19984719	0.2035487	0.9818151
## is22No	0.22497210	0.2013697	1.1172095
## is29No	-0.17339643	0.1200817	-1.4439874
## is210No	-1.32751786	0.1963138	-6.7622232
## is211No	-0.37490287	0.2093481	-1.7908114
## no yes, very rarely	-1.61710032	0.3362939	-4.8085926
## yes, very rarely yes, every now and then	-1.49696085	0.3359806	-4.4554976
## yes, every now and then yes, often	-1.04852514	0.3349725	-3.1301829
## yes, often yes, very often	-0.07295844	0.3341457	-0.2183432
##	p value		
## opzijno	3.096813e-04		
## loan2Rtotally agree	3.711051e-07		
## loan2Ragree	5.890349e-02		
## loan2Rdisagree	1.540384e-01		
## loan2Rtotally disagree	3.261909e-01		
## is22No	2.639048e-01		
## is29No	1.487425e-01		
## is210No	1.358902e-11		
## is211No	7.332357e-02		
## no yes, very rarely	1.519966e-06		

```
## yes, very rarely|yes, every now and then 8.369885e-06
## yes, every now and then|yes, often      1.746975e-03
## yes, often|yes, very often              8.271617e-01
```

Not receiving child support and child-bound budget are significant here, reducing application usage. Might possibly want to re-reference these variables to see if the opposite effect exists for people who do receive these social security payments.

To continue with the bank account/investment covariates:

##	Value	Std. Error	t value
## opzijno	-0.32418908	0.10142972	-3.1961942
## loan2Rtotally agree	0.68521253	0.12542246	5.4632365
## loan2Ragree	0.21630914	0.11309985	1.9125501
## loan2Rdisagree	0.19562507	0.16297195	1.2003603
## loan2Rtotally disagree	0.23212220	0.20184681	1.1499919
## bz03yes	0.45669633	0.11248154	4.0601890
## bz12yes	-0.38136637	0.14064381	-2.7115759
## bz19yes	0.02589421	0.21613384	0.1198064
## bz20yes	-0.06773507	0.09694875	-0.6986688
## no yes, very rarely	0.22388978	0.13434472	1.6665320
## yes, very rarely yes, every now and then	0.34203353	0.13442005	2.5445127
## yes, every now and then yes, often	0.78430249	0.13554408	5.7863281
## yes, often yes, very often	1.74350454	0.14078622	12.3840567
##	p value		
## opzijno	1.392534e-03		
## loan2Rtotally agree	4.675311e-08		
## loan2Ragree	5.580567e-02		
## loan2Rdisagree	2.299994e-01		
## loan2Rtotally disagree	2.501472e-01		
## bz03yes	4.903300e-05		
## bz12yes	6.696421e-03		
## bz19yes	9.046365e-01		
## bz20yes	4.847591e-01		
## no yes, very rarely	9.560749e-02		
## yes, very rarely yes, every now and then	1.094303e-02		
## yes, every now and then yes, often	7.194164e-09		
## yes, often yes, very often	3.188114e-35		

Here we see that having a savings account is significant and increases likelihood of using applications, and that having an investment/growth fund investment is also significant but reduces the chance of using applications.

The last test for having credit card debt:

##	Value	Std. Error	t value
## opzijno	-0.39690260	0.10001312	-3.9685055
## loan2Rtotally agree	0.67656729	0.12331423	5.4865306
## loan2Ragree	0.22373621	0.11243579	1.9899021
## loan2Rdisagree	0.20175734	0.16245472	1.2419297
## loan2Rtotally disagree	0.19569509	0.20100882	0.9735647
## cred1yes	0.55044299	0.21197074	2.5967876
## no yes, very rarely	-0.04201727	0.09334668	-0.4501207
## yes, very rarely yes, every now and then	0.07555428	0.09331245	0.8096914
## yes, every now and then yes, often	0.51383886	0.09400649	5.4659933

## yes, often yes, very often	1.46545419 0.09989959 14.6692717
##	p value
## opzijno	7.232478e-05
## loan2Rtotally agree	4.099044e-08
## loan2Ragree	4.660172e-02
## loan2Rdisagree	2.142625e-01
## loan2Rtotally disagree	3.302727e-01
## credlyes	9.410009e-03
## no yes, very rarely	6.526234e-01
## yes, very rarely yes, every now and then	4.181176e-01
## yes, every now and then yes, often	4.603217e-08
## yes, often yes, very often	1.014279e-48

Here we see a significant result for people who have credit card debt, they seem to use applications more. Having this link between debt and application usage exist is interesting, though needs more support before drawing conclusions is responsible.

Further testing intern with polr and covariates

The last test for internet usage forms a model with opzij and bijhoud:

##	Value	Std. Error
## opzijno	-0.08812911	0.09420202
## bijhoudI keep rather bad track of my expenditures	0.17415174	0.23927664
## bijhoudI more or less keep track of my expenditures	0.09807822	0.19109000
## bijhoudI keep good track of my expenditures	0.37151468	0.18910111
## bijhoudI keep very good track of my expenditures	0.86593682	0.20611920
## no yes, very rarely	-2.52947938	0.19906632
## yes, very rarely yes, every now and then	-1.89450270	0.18888217
## yes, every now and then yes, often	-0.45396787	0.18100054
## yes, often yes, very often	1.13172331	0.18239819
##	t value	p value
## opzijno	-0.9355332	3.495136e-01
## bijhoudI keep rather bad track of my expenditures	0.7278259	4.667202e-01
## bijhoudI more or less keep track of my expenditures	0.5132567	6.077718e-01
## bijhoudI keep good track of my expenditures	1.9646351	4.945649e-02
## bijhoudI keep very good track of my expenditures	4.2011459	2.655674e-05
## no yes, very rarely	-12.7067171	5.426508e-37
## yes, very rarely yes, every now and then	-10.0300771	1.124288e-23
## yes, every now and then yes, often	-2.5081023	1.213815e-02
## yes, often yes, very often	6.2046848	5.480663e-10

As mentioned earlier, this model has a few issues and might need some more testing. Opzij is not significant here, which is odd. Bijhoud shows significance in the higher levels, where it also has a positive effect.

Looking at the age covariates:

##	Value	Std. Error
## opzijno	-0.10201073	0.09458321
## bijhoudI keep rather bad track of my expenditures	0.17998952	0.23954740
## bijhoudI more or less keep track of my expenditures	0.08807373	0.19147842
## bijhoudI keep good track of my expenditures	0.35002010	0.18972815
## bijhoudI keep very good track of my expenditures	0.83923293	0.20666180

## youngadultyes	-0.16599376	0.16602535
## adultyes	-0.17512163	0.09183470
## no yes, very rarely	-2.66562677	0.21155335
## yes, very rarely yes, every now and then	-2.03106334	0.20205381
## yes, every now and then yes, often	-0.59047065	0.19419930
## yes, often yes, very often	1.00027614	0.19458160
##	t value	p value
## opzijno	-1.0785290	2.807978e-01
## bijhoudI keep rather bad track of my expenditures	0.7513733	4.524280e-01
## bijhoudI more or less keep track of my expenditures	0.4599669	6.455400e-01
## bijhoudI keep good track of my expenditures	1.8448507	6.505926e-02
## bijhoudI keep very good track of my expenditures	4.0609002	4.888386e-05
## youngadultyes	-0.9998097	3.174026e-01
## adultyes	-1.9069222	5.653066e-02
## no yes, very rarely	-12.6002577	2.104557e-36
## yes, very rarely yes, every now and then	-10.0520912	8.993830e-24
## yes, every now and then yes, often	-3.0405395	2.361547e-03
## yes, often yes, very often	5.1406512	2.737880e-07

Young adult is not significant here. Adult is, and has a small negative effect. Suggesting that being an adult reduces internet usage.

##	Value	Std. Error
## opzijno	-0.102004587	0.09458339
## bijhoudI keep rather bad track of my expenditures	0.179989430	0.23954786
## bijhoudI more or less keep track of my expenditures	0.088100451	0.19147882
## bijhoudI keep good track of my expenditures	0.350046055	0.18972856
## bijhoudI keep very good track of my expenditures	0.839248266	0.20666220
## youngadultyes	0.009116379	0.15871849
## pensioneryes	0.175116164	0.09183486
## no yes, very rarely	-2.490535082	0.20063889
## yes, very rarely yes, every now and then	-1.855943836	0.19048925
## yes, every now and then yes, often	-0.415341512	0.18277607
## yes, often yes, very often	1.175416004	0.18447080
##	t value	p value
## opzijno	-1.07846195	2.808277e-01
## bijhoudI keep rather bad track of my expenditures	0.75137147	4.524291e-01
## bijhoudI more or less keep track of my expenditures	0.46010545	6.454405e-01
## bijhoudI keep good track of my expenditures	1.84498347	6.503994e-02
## bijhoudI keep very good track of my expenditures	4.06096642	4.887000e-05
## youngadultyes	0.05743741	9.541968e-01
## pensioneryes	1.90685931	5.653881e-02
## no yes, very rarely	-12.41302264	2.221066e-35
## yes, very rarely yes, every now and then	-9.74303724	1.975596e-22
## yes, every now and then yes, often	-2.27240638	2.306198e-02
## yes, often yes, very often	6.37182706	1.867894e-10

Adding pensioners to this model is significant but also seems to increase internet usage which seems rather odd.

##	Value	Std. Error
## opzijno	-0.102008487	0.09458334
## bijhoudI keep rather bad track of my expenditures	0.179967176	0.23954781

## bijhoudI more or less keep track of my expenditures	0.088062110	0.19147876
## bijhoudI keep good track of my expenditures	0.350013002	0.18972849
## bijhoudI keep very good track of my expenditures	0.839210986	0.20666208
## adultyes	-0.009117248	0.15871842
## pensioneryes	0.165987969	0.16602557
## no yes, very rarely	-2.499650651	0.24638682
## yes, very rarely yes, every now and then	-1.865076985	0.23826188
## yes, every now and then yes, often	-0.424486162	0.23253178
## yes, often yes, very often	1.166277043	0.23381106
##	t value	p value
## opzijno	-1.07850369	2.808090e-01
## bijhoudI keep rather bad track of my expenditures	0.75127874	4.524849e-01
## bijhoudI more or less keep track of my expenditures	0.45990538	6.455841e-01
## bijhoudI keep good track of my expenditures	1.84480995	6.506519e-02
## bijhoudI keep very good track of my expenditures	4.06078848	4.890727e-05
## adultyes	-0.05744291	9.541924e-01
## pensioneryes	0.99977355	3.174201e-01
## no yes, very rarely	-10.14522862	3.479627e-24
## yes, very rarely yes, every now and then	-7.82784469	4.963045e-15
## yes, every now and then yes, often	-1.82549742	6.792600e-02
## yes, often yes, very often	4.98811748	6.097049e-07

Both age covariates become insignificant here.

	Value	Std. Error
## opzijno	-0.03395393	0.09575539
## bijhoudI keep rather bad track of my expenditures	0.13822719	0.24009505
## bijhoudI more or less keep track of my expenditures	0.06167657	0.19176540
## bijhoudI keep good track of my expenditures	0.36996703	0.18944616
## bijhoudI keep very good track of my expenditures	0.88267950	0.20655927
## is22No	0.19089818	0.19132832
## is29No	0.43541031	0.11380039
## is210No	0.09365744	0.19136560
## is211No	0.26864934	0.20720146
## no yes, very rarely	-1.65844977	0.36809444
## yes, very rarely yes, every now and then	-1.02133365	0.36284426
## yes, every now and then yes, often	0.42601406	0.36025258
## yes, often yes, very often	2.02438432	0.36330055
##	t value	p value
## opzijno	-0.3545903	7.228966e-01
## bijhoudI keep rather bad track of my expenditures	0.5757186	5.648054e-01
## bijhoudI more or less keep track of my expenditures	0.3216251	7.477367e-01
## bijhoudI keep good track of my expenditures	1.9528875	5.083293e-02
## bijhoudI keep very good track of my expenditures	4.2732505	1.926438e-05
## is22No	0.9977519	3.183997e-01
## is29No	3.8260879	1.301958e-04
## is210No	0.4894163	6.245470e-01
## is211No	1.2965610	1.947823e-01
## no yes, very rarely	-4.5055007	6.621663e-06
## yes, very rarely yes, every now and then	-2.8147990	4.880775e-03
## yes, every now and then yes, often	1.1825427	2.369904e-01
## yes, often yes, very often	5.5722028	2.515384e-08

Looking at the social security payments, only the Zorgtoeslag (is29) is significant. Not receiving this increases

internet usage. As you can only receive this when you are above a certain level of income, this suggests that people with higher income use internet more.

##	Value	Std. Error
## opzijno	-0.03472952	0.09619829
## bijhoudI keep rather bad track of my expenditures	0.18841196	0.23767824
## bijhoudI more or less keep track of my expenditures	0.07681667	0.18938074
## bijhoudI keep good track of my expenditures	0.34030243	0.18747776
## bijhoudI keep very good track of my expenditures	0.82469970	0.20471633
## bz03yes	0.26836906	0.11146942
## bz12yes	0.35913791	0.13630448
## bz19yes	0.55136612	0.21958414
## bz20yes	0.47277150	0.09585145
## no yes, very rarely	-1.97795972	0.21788007
## yes, very rarely yes, every now and then	-1.33314151	0.20938782
## yes, every now and then yes, often	0.13514822	0.20456720
## yes, often yes, very often	1.75430845	0.20812264
##	t value	p value
## opzijno	-0.3610201	7.180844e-01
## bijhoudI keep rather bad track of my expenditures	0.7927186	4.279418e-01
## bijhoudI more or less keep track of my expenditures	0.4056203	6.850216e-01
## bijhoudI keep good track of my expenditures	1.8151616	6.949907e-02
## bijhoudI keep very good track of my expenditures	4.0284999	5.613389e-05
## bz03yes	2.4075578	1.605962e-02
## bz12yes	2.6348211	8.418165e-03
## bz19yes	2.5109561	1.204047e-02
## bz20yes	4.9323354	8.125223e-07
## no yes, very rarely	-9.0782039	1.103812e-19
## yes, very rarely yes, every now and then	-6.3668533	1.929456e-10
## yes, every now and then yes, often	0.6606544	5.088340e-01
## yes, often yes, very often	8.4292054	3.480202e-17

Analyzing the special bank accounts and investments covariates, we see that these are all significant and all have a positive effect. This is interesting, as it suggests that investing or generally being more aware of your purchases increases the chance of using internet as payment. Another reason could be that a lot of these transactions now happen on the internet, thus encouraging internet payment methods.

##	Value	Std. Error
## opzijno	-0.08704775	0.09429203
## bijhoudI keep rather bad track of my expenditures	0.17066917	0.23961131
## bijhoudI more or less keep track of my expenditures	0.09462869	0.19151889
## bijhoudI keep good track of my expenditures	0.36850003	0.18942438
## bijhoudI keep very good track of my expenditures	0.86337237	0.20631207
## cred1yes	-0.05620099	0.21044743
## no yes, very rarely	-2.53459216	0.19997346
## yes, very rarely yes, every now and then	-1.89967723	0.18987303
## yes, every now and then yes, often	-0.45908739	0.18200835
## yes, often yes, very often	1.12682085	0.18330616
##	t value	p value
## opzijno	-0.9231719	3.559176e-01
## bijhoudI keep rather bad track of my expenditures	0.7122751	4.762944e-01
## bijhoudI more or less keep track of my expenditures	0.4940959	6.212385e-01
## bijhoudI keep good track of my expenditures	1.9453675	5.173076e-02

## bijhoudI keep very good track of my expenditures	4.1847884	2.854318e-05
## crediyes	-0.2670548	7.894270e-01
## no yes, very rarely	-12.6746425	8.173046e-37
## yes, very rarely yes, every now and then	-10.0049874	1.449101e-23
## yes, every now and then yes, often	-2.5223425	1.165762e-02
## yes, often yes, very often	6.1472066	7.885937e-10

Having credit card debt does not seem to be significant within the model.

Last note: some of the covariates that seemed interesting from data exploration were not tested with the polr models, as they only seemed interesting for one or two payment methods. I might add these in my analysis still to get more detailed distinction between the models and thus more support for H1.

Analysis results - H2

Hypothesis 2: Pain of paying is increased as a purchase becomes more complex.

To show an effect in this relationship there needs to be an increase in the pain of paying (linked to mental accounting, so best to use the same variables) when a purchase becomes more complex. The increase in complexity of a purchase needs to be explained. My theory is that less common purchases, of higher value, and with more specific knowledge needed, are more difficult for consumers to make. In the dataset there are questions for specific vehicle types (cars, motor vehicles, boats, and caravans) which could be classified in an increasingly complex manner. Would be easier if there are small purchases to show a difference.

Variable list:

Dependent variables

Pain of paying measures: - zinvol (measure of motivation to save money) - 4-point scale on whether the respondent thinks that saving money is useful.

- opzij (measure of actual actions toward savings)
 - yes/no answer to the question “have you saved money in the past 12 months?”
- beschryf (measure of risk avoidance/seeking behaviour)
 - 5-point scale where 1 is “taking few risks” and 5 is “taking considerable risks”
- uitgeven (measure of impulsivity spending)
 - 7-point scale where 1 signifies spending your money immediately, and 7 signifies saving as much as possible.
- bijhoud (measure of budgeting skills)
 - 5-point scale asking respondents how well they keep track of their expenditures
- loan2 (measure of loan availability)
 - yes/no answer to the question “can you obtain a loan right now?”
- loan3 (measure of ability to pay back debt)
 - yes/no answer to the question “have you ever had debt assistance?”
- hoevspa (measure of level of savings)
 - 7-point scale of amount of savings respondents have

These variables together can be used to infer the pain of paying respondents experience. In H1 I used these measures for mental accounting as well. This is probably not scientifically sound but I do not know which measures I would need to use instead. Might have to look at the dataset again to see if I can find another way to measure this. (Needs some more explanation)

If this has to be one variable, I could recode it by selecting certain answers of each variable to indicate a level of pain of paying (score-based?). Actual pain of paying variable could be low-medium-high. **Independent variables**

Purchase complexity measures:

- bz20
 - Whether someone owns one or more cars
- aut2
 - Number of cars someone owns. Filter for people with 0/1/(maybe 2) vehicles.
- aut701
 - purchasing value of the (first) car, continuous. A pattern could be seen in the continuous format that stays hidden in the categorical one.
- aut7a01
 - purchasing value of the (first) car, categorical. Price could be used as a proxy for complexity, though this seems weak on its own.
- bz21
 - whether someone owns one or more motor vehicles (bikes)
- mot2
 - Number of motor vehicles someone owns. Filter for people with 0/1/(maybe 2) vehicles
- mot2b
 - value of the motor vehicles (categorical)
- mot2a
 - value of the motor vehicles (continuous)
- bz22
 - whether someone owns one or more (motorized) boats
- boo2
 - Number of boats someone owns. Filter for people who have a 0/1/(maybe 2) boats.
- boo2b
 - categorical value of the boat
- boo2a
 - continuous value of the boat
- bz23
 - whether someone owns one or more caravans
- car2
 - Number of caravans someone owns. Filter for people with 0/1/(maybe 2).

- car3a
 - categorical value of the caravan(s)
- car3
 - continuous value of the caravan(s)

I want some more measures for less complex purchases or smaller items in general. Will need to search through dataset to see what is available.

Preliminary testing of pain of paying / mental accounting measures

First I take a look at the individual pain of paying / mental accounting measures and whether owning some of the high-value products are significantly related to them.

```
##
## Call:
## lm(formula = zinvol ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.8219 -0.6690 -0.6162  0.3310  2.3838
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.89134    0.21418   8.831  <2e-16 ***
## bz20          -0.11584    0.04538  -2.552   0.0108 *
## bz21           0.02512    0.08805   0.285   0.7755
## bz22           0.03704    0.16416   0.226   0.8215
## bz23          -0.05279    0.08140  -0.649   0.5167
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8764 on 1816 degrees of freedom
## (143 observations deleted due to missingness)
## Multiple R-squared:  0.004179,    Adjusted R-squared:  0.001986
## F-statistic: 1.905 on 4 and 1816 DF,  p-value: 0.107
```

It seems that bz20 (owning one or more cars) is significant when people consider whether it is useful to save, with the independent variable having a negative estimate. In this case, a negative value means that people are more likely to consider saving important (as the value of opzij in the dataset is “1” for yes and “2” for no).

```
##
## Call:
## lm(formula = opzij ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.3357 -0.2740 -0.2740  0.6643  0.8061
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)  1.51530    0.10983   13.797 < 2e-16 ***
## bz20         -0.06174    0.02289   -2.697  0.00706 **
## bz21         -0.03214    0.04536   -0.709  0.47870
## bz22         -0.03773    0.08462   -0.446  0.65575
## bz23         -0.04798    0.04177   -1.149  0.25090
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4518 on 1874 degrees of freedom
## (85 observations deleted due to missingness)
## Multiple R-squared:  0.005846, Adjusted R-squared:  0.003724
## F-statistic: 2.755 on 4 and 1874 DF, p-value: 0.02663
```

Opzij has a similar effect, only being affected by the car ownership variable. This variable is coded similarly to zinvol, so the negative estimate shows people who own a car do indeed tend to save more.

```
##
## Call:
## lm(formula = beschryf ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.40441 -1.00666 -0.00666  0.99334  3.12504
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.56837    0.37009   4.238 2.53e-05 ***
## bz20         0.13170    0.08414   1.565   0.118
## bz21        -0.13494    0.15488  -0.871   0.384
## bz22         0.39775    0.27110   1.467   0.143
## bz23        -0.08792    0.12937  -0.680   0.497
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.004 on 770 degrees of freedom
## (1189 observations deleted due to missingness)
## Multiple R-squared:  0.007147, Adjusted R-squared:  0.001989
## F-statistic: 1.386 on 4 and 770 DF, p-value: 0.2371
```

The beschryf variable does not seem to be affected by people's relatively big purchases.

```
##
## Call:
## lm(formula = uitgeven ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.2868 -0.4563  0.0310  0.7132  2.1228
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.47618    0.28392  15.766 < 2e-16 ***
## bz20         0.31778    0.05844   5.438 6.06e-08 ***
```

```
## bz21      -0.09183    0.11911  -0.771    0.441
## bz22       0.09739    0.22057   0.442    0.659
## bz23       0.16949    0.11016   1.539    0.124
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.197 on 1959 degrees of freedom
## Multiple R-squared:  0.01794,    Adjusted R-squared:  0.01593
## F-statistic: 8.944 on 4 and 1959 DF,  p-value: 3.714e-07
```

The uitgeven variable reinforces the view that people who own a car are inclined to save more, as it is very significant and has a positive estimate.

```
##
## Call:
## lm(formula = bijhoud ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.6644 -0.5877  0.4123  0.6101  1.9608
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.55802    0.24970  14.249 < 2e-16 ***
## bz20          0.19782    0.05139   3.849 0.000122 ***
## bz21         -0.09199    0.10475  -0.878 0.379992
## bz22         -0.35066    0.19398  -1.808 0.070801 .
## bz23          0.07670    0.09688   0.792 0.428658
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.053 on 1959 degrees of freedom
## Multiple R-squared:  0.009997,    Adjusted R-squared:  0.007975
## F-statistic: 4.945 on 4 and 1959 DF,  p-value: 0.0005743
```

An interesting result here: owning a boat is now also significant. The estimate is negative, suggesting that people who own a boat keep less track of their expenditures. A reason for this could be that a boat is a hedonic item and a big purchase, only bought by people who already have quite a lot of money. Car owners show the usual behaviour, having a positive estimate and thus being more likely to keep better track of their expenditures.

```
##
## Call:
## lm(formula = loan2 ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.7048 -0.7048 -0.3199  0.6802  3.0713
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.13777    0.26856  15.407 < 2e-16 ***
## bz20         -0.38496    0.05598  -6.877 8.28e-12 ***
```

```
## bz21      -0.39115    0.11092   -3.526 0.000431 ***
## bz22      -0.48535    0.20691   -2.346 0.019097 *
## bz23      -0.17150    0.10215   -1.679 0.093345 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.105 on 1874 degrees of freedom
## (85 observations deleted due to missingness)
## Multiple R-squared:  0.04047,    Adjusted R-squared:  0.03843
## F-statistic: 19.76 on 4 and 1874 DF,  p-value: 5.992e-16
```

```
table(H2set$loan2)
```

```
##
##      totally agree      agree agree nor disagree      disagree
##           450           638           496           184
##      totally disagree
##           111
```

```
table(nH2set$loan2)
```

```
##
##      1      2      3      4      5
## 450 638 496 184 111
```

Loan2 provides interesting results. All variables are significant, with all having a negative effect (meaning ownership of each vehicle makes people more likely to think they can get a loan). This seems to imply people who are well-off would make these bigger purchases. Interestingly enough caravan owners have a smaller estimate than the rest, suggesting ownership of a caravan is less telling.

```
##
## Call:
## lm(formula = loan3 ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.99495  0.01946  0.01946  0.05060  0.05060
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.876778   0.039747  47.218 < 2e-16 ***
## bz20         0.031137   0.008284   3.759 0.000176 ***
## bz21         0.014411   0.016416   0.878 0.380114
## bz22         0.023597   0.030623   0.771 0.441061
## bz23         0.003477   0.015119   0.230 0.818137
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1635 on 1874 degrees of freedom
## (85 observations deleted due to missingness)
## Multiple R-squared:  0.008991,    Adjusted R-squared:  0.006876
## F-statistic:  4.25 on 4 and 1874 DF,  p-value: 0.001991
```


Effect sizes for loan3 are really small, and only car ownership is significant. This does not seem to tell much.

```
##
## Call:
## lm(formula = hoevspa ~ bz20 + bz21 + bz22 + bz23, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.6141 -0.8767 -0.2026  0.7974  5.1233
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.92165    0.26957   3.419 0.000644 ***
## bz20         0.32588    0.05779   5.639 2e-08 ***
## bz21         0.13688    0.11321   1.209 0.226804
## bz22         0.41149    0.20293   2.028 0.042737 *
## bz23         0.08079    0.10281   0.786 0.432101
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.064 on 1677 degrees of freedom
## (282 observations deleted due to missingness)
## Multiple R-squared:  0.02442,    Adjusted R-squared:  0.02209
## F-statistic: 10.49 on 4 and 1677 DF,  p-value: 2.135e-08
```

Ownership of a car and boat are significant for the amount of savings someone has, both with a positive estimate. This suggests people who own a boat/car save more.

Vehicle tests

Further testing for each mental accounting proxy, but now with models specifically for vehicle values.

Set of categorical values: aut7a01, mot2b, boo2b, car3a -> table function shows that only the cars variable (aut7a01) has a usable number of responses Set of continuous values: aut701, mot2a, boo2a, car3 -> table function shows that only the car variable (aut701) and the caravan variable (car3) have usable responses.

Thus the only variables that can be used for further testing on costs are aut7a01, aut701 and car3.

```
##                                     Value Std. Error
## aut7a01between 500 euro and 1.500 euro  1.266451e+01  40.63863
## aut7a01between 1.500 euro and 2.500 euro  1.321523e+01  40.65748
## aut7a01between 2.500 euro and 5.000 euro  1.239353e+01  40.63426
## aut7a01between 5.000 euro and 7.500 euro  1.204207e+01  40.63365
## aut7a01between 7.500 euro and 10.000 euro 1.295869e+01  40.63368
## aut7a01between 10.000 euro and 12.000 euro 1.238532e+01  40.63424
## aut7a01between 12.000 euro and 15.000 euro 1.133875e+01  40.63501
## aut7a01between 15.000 euro and 20.000 euro 1.243185e+01  40.63297
## aut7a01between 20.000 euro and 25.000 euro 1.235558e+01  40.63389
## aut7a01between 25.000 euro and 50.000 euro 1.216506e+01  40.63450
## aut7a01between 50.000 euro and 75.000 euro -6.445036e-05 409.97143
## yes, certainly|yes, perhaps  1.222919e+01  40.63146
## yes, perhaps|probably not  1.420083e+01  40.63192
## probably not|certainly not  1.583921e+01  40.63433
```

```
##                                t value    p value
## aut7a01between 500 euro and 1.500 euro    3.116372e-01 0.7553163
## aut7a01between 1.500 euro and 2.500 euro    3.250381e-01 0.7451522
## aut7a01between 2.500 euro and 5.000 euro    3.050020e-01 0.7603646
## aut7a01between 5.000 euro and 7.500 euro    2.963571e-01 0.7669574
## aut7a01between 7.500 euro and 10.000 euro    3.189150e-01 0.7497910
## aut7a01between 10.000 euro and 12.000 euro    3.048000e-01 0.7605185
## aut7a01between 12.000 euro and 15.000 euro    2.790389e-01 0.7802150
## aut7a01between 15.000 euro and 20.000 euro    3.059546e-01 0.7596392
## aut7a01between 20.000 euro and 25.000 euro    3.040709e-01 0.7610738
## aut7a01between 25.000 euro and 50.000 euro    2.993775e-01 0.7646520
## aut7a01between 50.000 euro and 75.000 euro   -1.572069e-07 0.9999999
## yes, certainly|yes, perhaps    3.009784e-01 0.7634309
## yes, perhaps|probably not      3.494994e-01 0.7267144
## probably not|certainly not     3.897988e-01 0.6966853
```

This does not seem to hold any significant factors, so the categorical value of the car does not seem to affect whether people think it is useful to save.

```
##
## Call:
## lm(formula = opzij ~ aut701 + car3, data = nH2set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54260 -0.26393 -0.19785  0.01932  0.84451
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.141e+00  8.605e-02  13.265  <2e-16 ***
## aut701        3.853e-06  4.402e-06   0.875    0.384
## car3          4.027e-06  4.112e-06   0.979    0.330
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.434 on 89 degrees of freedom
## (1872 observations deleted due to missingness)
## Multiple R-squared:  0.02799,    Adjusted R-squared:  0.006146
## F-statistic: 1.281 on 2 and 89 DF,  p-value: 0.2827
```

The explaining value of both car and caravan values (continuous) is nonexistent for the opzij variable.

(Test was producing error in knitting process, removed as I could not figure out why it was blocking the knit.) All estimates here are negative with some of them being very significant. Seems risky to draw conclusions from as the number of responses for this is rather low, but the estimates are all consistent (except for the one level that is insignificant). So it seems logical to say that owning a car makes people move towards risk-avoiding behaviour.

```
##                                Value Std. Error    t value
## aut7a01between 500 euro and 1.500 euro    0.8191866    1.694447  0.4834537
## aut7a01between 1.500 euro and 2.500 euro    4.3198799    2.202090  1.9617183
## aut7a01between 2.500 euro and 5.000 euro    2.4174388    1.588043  1.5222754
## aut7a01between 5.000 euro and 7.500 euro    3.3854435    1.569177  2.1574651
## aut7a01between 7.500 euro and 10.000 euro    2.7611393    1.561537  1.7682193
```

## aut7a01between 10.000 euro and 12.000 euro	3.1645064	1.566963	2.0195153
## aut7a01between 12.000 euro and 15.000 euro	2.8771277	1.565939	1.8373174
## aut7a01between 15.000 euro and 20.000 euro	3.2945173	1.549194	2.1266012
## aut7a01between 20.000 euro and 25.000 euro	3.1713891	1.574446	2.0142894
## aut7a01between 25.000 euro and 50.000 euro	3.9274984	1.596444	2.4601543
## aut7a01between 50.000 euro and 75.000 euro	2.5372374	2.136126	1.1877751
## 1 I spend all my money immediately 2	-1.4712937	1.575566	-0.9338189
## 2 3	-0.5070817	1.472324	-0.3444091
## 3 4	0.5071094	1.472324	0.3444279
## 4 5	1.7669673	1.498212	1.1793841
## 5 6	3.3081894	1.509786	2.1911640
## 6 7 I save as much as possible	5.3302066	1.531767	3.4797758
##	p value		
## aut7a01between 500 euro and 1.500 euro	0.6287736397		
## aut7a01between 1.500 euro and 2.500 euro	0.0497952885		
## aut7a01between 2.500 euro and 5.000 euro	0.1279400871		
## aut7a01between 5.000 euro and 7.500 euro	0.0309694453		
## aut7a01between 7.500 euro and 10.000 euro	0.0770242508		
## aut7a01between 10.000 euro and 12.000 euro	0.0434336919		
## aut7a01between 12.000 euro and 15.000 euro	0.0661630486		
## aut7a01between 15.000 euro and 20.000 euro	0.0334532303		
## aut7a01between 20.000 euro and 25.000 euro	0.0439791629		
## aut7a01between 25.000 euro and 50.000 euro	0.0138877290		
## aut7a01between 50.000 euro and 75.000 euro	0.2349220433		
## 1 I spend all my money immediately 2	0.3503973286		
## 2 3	0.7305386756		
## 3 4	0.7305245347		
## 4 5	0.2382452593		
## 5 6	0.0284399248		
## 6 7 I save as much as possible	0.0005018336		

Quite a few of these levels are significant with a positive value, suggesting that car ownership moves people towards more of a saving preference.

##	
## aut7a01between 500 euro and 1.500 euro	2.5988
## aut7a01between 1.500 euro and 2.500 euro	2.7090
## aut7a01between 2.500 euro and 5.000 euro	2.4720
## aut7a01between 5.000 euro and 7.500 euro	2.6400
## aut7a01between 7.500 euro and 10.000 euro	2.5640
## aut7a01between 10.000 euro and 12.000 euro	2.6850
## aut7a01between 12.000 euro and 15.000 euro	2.5900
## aut7a01between 15.000 euro and 20.000 euro	2.7140
## aut7a01between 20.000 euro and 25.000 euro	2.5610
## aut7a01between 25.000 euro and 50.000 euro	2.6280
## aut7a01between 50.000 euro and 75.000 euro	1.6270
## I don't or very badly keep track of my expenditures I keep rather bad track of my expenditures	2.3150
## I keep rather bad track of my expenditures I more or less keep track of my expenditures	2.3860
## I more or less keep track of my expenditures I keep good track of my expenditures	2.5870
## I keep good track of my expenditures I keep very good track of my expenditures	2.8300
##	Std
## aut7a01between 500 euro and 1.500 euro	9.1350
## aut7a01between 1.500 euro and 2.500 euro	1.5430
## aut7a01between 2.500 euro and 5.000 euro	4.9390

## aut7a01between 5.000 euro and 7.500 euro	4.466
## aut7a01between 7.500 euro and 10.000 euro	4.540
## aut7a01between 10.000 euro and 12.000 euro	5.250
## aut7a01between 12.000 euro and 15.000 euro	5.133
## aut7a01between 15.000 euro and 20.000 euro	4.565
## aut7a01between 20.000 euro and 25.000 euro	5.057
## aut7a01between 25.000 euro and 50.000 euro	4.712
## aut7a01between 50.000 euro and 75.000 euro	3.612
## I don't or very badly keep track of my expenditures I keep rather bad track of my expenditures	3.784
## I keep rather bad track of my expenditures I more or less keep track of my expenditures	3.102
## I more or less keep track of my expenditures I keep good track of my expenditures	2.386
## I keep good track of my expenditures I keep very good track of my expenditures	3.192
##	t
## aut7a01between 500 euro and 1.500 euro	28.4
## aut7a01between 1.500 euro and 2.500 euro	17.5
## aut7a01between 2.500 euro and 5.000 euro	50.0
## aut7a01between 5.000 euro and 7.500 euro	59.1
## aut7a01between 7.500 euro and 10.000 euro	56.4
## aut7a01between 10.000 euro and 12.000 euro	51.1
## aut7a01between 12.000 euro and 15.000 euro	50.4
## aut7a01between 15.000 euro and 20.000 euro	59.4
## aut7a01between 20.000 euro and 25.000 euro	50.0
## aut7a01between 25.000 euro and 50.000 euro	55.7
## aut7a01between 50.000 euro and 75.000 euro	4503.9
## I don't or very badly keep track of my expenditures I keep rather bad track of my expenditures	61.1
## I keep rather bad track of my expenditures I more or less keep track of my expenditures	76.9
## I more or less keep track of my expenditures I keep good track of my expenditures	108.4
## I keep good track of my expenditures I keep very good track of my expenditures	88.0
##	
## aut7a01between 500 euro and 1.500 euro	5.420
## aut7a01between 1.500 euro and 2.500 euro	5.59
## aut7a01between 2.500 euro and 5.000 euro	0.00
## aut7a01between 5.000 euro and 7.500 euro	0.00
## aut7a01between 7.500 euro and 10.000 euro	0.00
## aut7a01between 10.000 euro and 12.000 euro	0.00
## aut7a01between 12.000 euro and 15.000 euro	0.00
## aut7a01between 15.000 euro and 20.000 euro	0.00
## aut7a01between 20.000 euro and 25.000 euro	0.00
## aut7a01between 25.000 euro and 50.000 euro	0.00
## aut7a01between 50.000 euro and 75.000 euro	0.00
## I don't or very badly keep track of my expenditures I keep rather bad track of my expenditures	0.00
## I keep rather bad track of my expenditures I more or less keep track of my expenditures	0.00
## I more or less keep track of my expenditures I keep good track of my expenditures	0.00
## I keep good track of my expenditures I keep very good track of my expenditures	0.00

Everything is significant at a really high level which seems odd, but the values are all similar and point toward people who own a car keeping better track of their expenditures.

Analysis results - H3

Hypothesis 3: Financial distress is worsened when a debtor has lower budgeting skills.

Variable list:

Dependent variables

Financial distress variables: - bet131 - whether someone's bank account has a credit or deficit

- bet141
 - balance of the bank account, either positive or negative. Filter with bet131 to obtain continuous sets for positive and negative balances.
- bz03
 - whether someone has a savings account. Not having savings is a risk factor for debt.
- spa4 - turns out this only has 2 responses, useless.
 - the balance of the savings account. Low savings can be just as risky as not having an account.
- zinvol (measure of motivation to save money)
 - 4-point scale on whether the respondent thinks that saving money is useful. Attitude towards saving can be an indicator for financial distress in the future.
- hoevspa (measure of level of savings)
 - 7-point scale of amount of savings respondents have
- loan3 (measure of ability to pay back debt)
 - yes/no answer to the question “have you ever had debt assistance?”
- opzij (measure of actual actions toward savings)
 - yes/no answer to the question “have you saved money in the past 12 months?”

Independent variables

Budgeting skills variables: - bijhoud - measure of budgeting skills which asks how well respondents keep track of their expenses

- account
 - asks whether people are the main cost manager of their household.
- finsitu
 - describes the financial situation of the household.

Seems like too few budgeting skills, might need to look for more.

Testing for budgeting skills

These initial tests will measure whether the budgeting skills factor can appropriately explain variance within the indicators for financial distress I selected.

```
##  
## Call:  
## lm(formula = bet131 ~ bijhoud + account + finsitu, data = nh3set)  
##  
## Residuals:
```

```
##      Min      1Q   Median      3Q      Max
## -0.19112 -0.07150 -0.02628 -0.00993  0.97858
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.203642   0.031999  37.616  <2e-16 ***
## bijhoud     -0.004862   0.004701  -1.034   0.3013
## account      0.021209   0.011696   1.813   0.0699 .
## finsitu     -0.050083   0.005409  -9.259  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2019 on 1713 degrees of freedom
## (247 observations deleted due to missingness)
## Multiple R-squared:  0.05044,    Adjusted R-squared:  0.04878
## F-statistic: 30.33 on 3 and 1713 DF,  p-value: < 2.2e-16
```

Being the person who controls a family's expenditures seems to have a small but significant effect on the chance of having a bank account deficit. The financial situation of a household is also significant, and having saved more as a family seems to reduce the chance of having a bank account deficit. The bijhoud variable does not seem to affect this.

```
##
## Call:
## lm(formula = bet141 ~ bijhoud + account + finsitu, data = subset(nH3set %>%
##   filter(nH3set$bet131 == 1 & nH3set$bet141 > 0)))
##
## Residuals:
##      Min      1Q  Median      3Q      Max
## -6148  -2217  -1132     93  196240
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    173.0     2159.6   0.080  0.93615
## bijhoud       -876.1     300.6  -2.915  0.00364 **
## account       1630.4     778.4   2.094  0.03647 *
## finsitu        738.7     352.9   2.093  0.03657 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9885 on 1022 degrees of freedom
## (48 observations deleted due to missingness)
## Multiple R-squared:  0.01502,    Adjusted R-squared:  0.01213
## F-statistic: 5.196 on 3 and 1022 DF,  p-value: 0.001451
```

This test has some interesting results. As people keep better track of their expenditures, their estimate for account balance goes down. This could have a few reasons, one of them possibly being that people with lower account balance tend to keep more track of their expenses as they need to worry more about breaking into a deficit. Being the primary accountant of the family and having a healthy financial situation improves people's bank balance.

```
##
## Call:
```

```
## lm(formula = bet141 ~ bijhoud + account + finsitu, data = subset(nH3set %>%
##   filter(nH3set$bet131 == 2 & nH3set$bet141 > 0)))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6457  -5022  -3136  -1381   38834
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -7614      13160  -0.579   0.566
## bijhoud         1107       1418   0.781   0.440
## account        3031       6288   0.482   0.633
## finsitu         825       1582   0.521   0.605
##
## Residual standard error: 10380 on 37 degrees of freedom
## (3 observations deleted due to missingness)
## Multiple R-squared:  0.03001, Adjusted R-squared:  -0.04864
## F-statistic: 0.3815 on 3 and 37 DF, p-value: 0.7669
```

This test is for people who reported having a deficit on their bank account. None of these results are significant, however.

```
##
## Call:
## lm(formula = bz03 ~ bijhoud + account + finsitu, data = nH3set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.92976  0.07104  0.14050  0.23837  0.44741
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.2472736  0.0586986  21.249 < 2e-16 ***
## bijhoud     -0.0002652  0.0088672  -0.030   0.976
## account      0.1677337  0.0211692   7.923 3.93e-15 ***
## finsitu      0.0694561  0.0101790   6.823 1.20e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3993 on 1875 degrees of freedom
## (85 observations deleted due to missingness)
## Multiple R-squared:  0.0541, Adjusted R-squared:  0.05259
## F-statistic: 35.75 on 3 and 1875 DF, p-value: < 2.2e-16
```

Having a savings account is significantly affected by being the household cost manager and by a household's financial situation.

```
##
## Call:
## lm(formula = zinvol ~ bijhoud + account + finsitu, data = nH3set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -1.3161 -0.6515 -0.4096  0.4094  2.6184
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.62354    0.12954  20.252 < 2e-16 ***
## bijhoud     -0.06086    0.01947  -3.126  0.0018 **
## account     -0.03278    0.04660  -0.704  0.4818
## finsitu     -0.18098    0.02229  -8.119 8.58e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8596 on 1817 degrees of freedom
## (143 observations deleted due to missingness)
## Multiple R-squared:  0.04143, Adjusted R-squared:  0.03985
## F-statistic: 26.18 on 3 and 1817 DF, p-value: < 2.2e-16
```

Bijhoud and financial situation are significant here and negative, which means that people who keep track of their expenses and have a good financial situation are more likely to find saving useful. Especially the finsitu estimate is sizeable here, the bijhoud estimate not so much.

```
##
## Call:
## lm(formula = hoevspa ~ bijhoud + account + finsitu, data = nh3set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.7772 -0.8288 -0.2580  0.6642  5.5554
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.96675    0.16124   5.996 2.47e-09 ***
## bijhoud     -0.04498    0.02399  -1.875  0.061 .
## account     -0.03285    0.05823  -0.564  0.573
## finsitu      0.38422    0.02753  13.957 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.019 on 1678 degrees of freedom
## (282 observations deleted due to missingness)
## Multiple R-squared:  0.1054, Adjusted R-squared:  0.1038
## F-statistic: 65.92 on 3 and 1678 DF, p-value: < 2.2e-16
```

Interesting here is that bijhoud is significant here, and has a negative estimate. This would suggest that keeping better track of expenditures would reduce the amount of money that is saved. This seems contradictory though, and would require further checking. Finsitu makes a bit more sense, as a better financial situation within the household would imply higher savings.

```
##
## Call:
## lm(formula = loan3 ~ bijhoud + account + finsitu, data = nh3set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```



```
## -0.99385  0.01512  0.02189  0.03989  0.09686
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.919659   0.023925  80.238 < 2e-16 ***
## bijhoud     -0.005245   0.003614  -1.451   0.147
## account     -0.006769   0.008628  -0.785   0.433
## finsitu      0.023243   0.004149   5.602 2.43e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1627 on 1875 degrees of freedom
## (85 observations deleted due to missingness)
## Multiple R-squared:  0.01792, Adjusted R-squared:  0.01635
## F-statistic: 11.41 on 3 and 1875 DF, p-value: 2.064e-07
```

Finsitu is the only significant variable here though that does not tell us much, as this relationship seems self-explanatory. As a family's financial situation is good, it likely means they have not had debt assistance. Thus, it makes sense that the estimate is small.

```
##
## Call:
## lm(formula = opzij ~ bijhoud + account + finsitu, data = nH3set)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.9150 -0.1951 -0.1817  0.3339  1.0739
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.116944   0.058675  36.079 <2e-16 ***
## bijhoud     -0.006723   0.008864  -0.758   0.448
## account      0.020115   0.021161   0.951   0.342
## finsitu     -0.235475   0.010175 -23.142 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3991 on 1875 degrees of freedom
## (85 observations deleted due to missingness)
## Multiple R-squared:  0.2239, Adjusted R-squared:  0.2226
## F-statistic: 180.3 on 3 and 1875 DF, p-value: < 2.2e-16
```

Having saved money in the past 12 months is only significantly affected by the financial situation of the household. The estimate being negative implies that a better financial situation encourages people to save.

Next I will categorize some of the dependent variables to see if there are group effects.

```
H3testall <- lm(bz03 + hoevspa + opzijswitch ~ bijhoud + account + finsitu, data=nH3set)
summary(H3testall)
```

```
##
## Call:
## lm(formula = bz03 + hoevspa + opzijswitch ~ bijhoud + account +
```

```
##      finsitu, data = nH3set)
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -3.7281 -0.9039  0.0565   0.8210  6.4574
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.22074    0.19575  16.453  <2e-16 ***
## bijhoud      -0.03951    0.02913  -1.357    0.175
## account       0.10821    0.07069   1.531    0.126
## finsitu       0.66608    0.03342  19.930  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.237 on 1678 degrees of freedom
## (282 observations deleted due to missingness)
## Multiple R-squared:  0.1917, Adjusted R-squared:  0.1903
## F-statistic: 132.7 on 3 and 1678 DF,  p-value: < 2.2e-16
```

Grouping three variables together that indicate savings shows that the financial situation of a household is an important explanatory variable here too, with a positive estimate meaning more savings when a household is financially healthy. The other two variables seem less significant here.

Note: opzij replaced with opzijswitch here, which has inverted values. This is done to make all positive increases line up for the explanatory variables, meaning that an increase is always an indicator of motivation to save.

Analysis summaries

H1:

As a first step, I regressed the mental accounting proxies on each payment method to see which of the variables explained payment method usage the best. These models came out as follows:

- Pin: loan2 & hoevspa – measures for loan obtainment possibility and how much respondents have saved. This suggests that people mainly adjust their pin usage based on the heuristic of being able to obtain a loan (people might see this as an indicator for their financial stability), and the amount they have saved. The estimate for loan2 was negative, suggesting that as people become less certain of being to obtain a loan, they use pin less. On the other hand, the estimate for hoevspa was positive, suggesting that as people save more they use pin more often.
- Nfc: uitgeven, bijhoud, loan2 and hoevspa – measures for impulsivity vs. spending, keeping track of expenditures, loan obtainment possibility and how much respondents have saved. This set of measures being larger than pin's suggests that there are more factors people incorporate into their decision to use nfc as payment method. Uitgeven, bijhoud and loan2 had negative estimates, suggesting that preferring saving over impulsive spending, keeping better track of expenses and being less certain of getting a loan reduce nfc usage. Hoevspa had a positive estimate, suggesting that higher savings means people use nfc more.
- Smart (applications): Opzij, loan2 and loan3 – measures for whether people have saved, being able to obtain a loan and having received debt assistance. These all had negative estimates, suggesting that not having saved money, being uncertain of getting a loan and not having received debt assistance

decrease application usage. Interesting here is that the debt assistance variable is significant, suggesting that an inverse effect could be in place too (having had debt assistance increasing the chance of using applications). This is hard to check though, since later tests make the loan3 variable insignificant and thus hard to work with.

- Intern: opzij & bijhoud – measures for having saved money and how well respondents keep track of their expenditures. These both had positive estimates, suggesting that they increase internet usage. Interesting here is the positive context, as most explanatory variables for the other methods so far have had a decreasing effect. Internet payment seems to be mostly dependent on how well people are aware of their finances, and less on savings and financial health heuristics (loan2) we saw with the other methods.

polr & covariate testing

The second step consisted of analysis with the polr function, allowing research into which factors of each variable contributed the most to explaining payment method usage. This was coupled with implementing covariate groups into the models. The covariates were chosen based on them showing an effect when working on data visualization.

- Pin: loan2 was typically significant on each level, suggesting strong explanatory power. Hoevspa was only significant at more moderate levels of savings (5-12.5k and 12.5-20k). Including age groups as covariates suggested that young adults and adults groups had a positive impact on the chance of using pin, and pensioners negative. In the social security tests only child support seemed significant, with people not receiving it using pin less. Taxable income showed an increase of pin usage at high levels. Testing for differences between credit/deficit on respondents' bank account did not prove significant. Adding investment covariates in the model showed that people with an extra savings account was significant, increasing pin usage.
- Nfc: the highest levels of the uitgeven variable, which indicated people heavily prefer saving over spending, were significant and negative (reducing nfc usage). Bijhoud (keeping track of expenditures) and loan2 (being able to obtain a loan) had a similar yet smaller effect. The hoevspa variable showed the effect that had been seen before, increased savings means more nfc usage. Adding age groups as covariates showed the same result as for pin, having increased usage by young adults and adults and decreased usage for pensioners. Further covariates either had little to no effect.
- Smart: not having saved (opzij) was significant, reducing application usage. Being confident in being able to obtain a loan also increased application usage. We see the same effect for age groups again, albeit with more extreme estimates. This would suggest that age is a more important explanatory variable for this payment method than for the previous two. From the social security covariates not receiving child support * child-bound budget were significant, reducing application usage. Having a savings account increased application usage, and having invested in an investment/growth fund decreased it. Lastly an interesting note: having credit card debt proved to increase application usage, whereas this variable showed no result for the previous tests. This could be an indicator for more risky behaviour when using applications to pay.
- Intern: this model might need some revision as there was only one explanatory variable that has significant levels (bijhoud), which makes the model rather weak. Nevertheless, the age groups showed some interesting results. Being a young adult did not seem to increase internet usage, but being a pensioner did. Could be a hiccup of the model, or could actually be an effect where pensioners keep track of their expenses through their bank's internet page. Also interesting is that the social security Zorgtoeslag was significant, suggesting not receiving this increases internet usage. As you can only receive this social security when your income is below a certain level, this could suggest that higher income leads to more internet payment usage.

I want to conduct some more specific tests for this hypothesis with other covariates to see specific effects per payment method, and re-test the internet payment model to see if I can improve it. For now, it seems that

more thought goes into the less transparent payment methods. This seems contradictory to my hypothesis, though this could also mean that people make more of an attempt to consider their need of the purchase. Whether they succeed or fail this consideration is not something I can show, though could have some exploration in literature.

H2:

Tests for this hypothesis first intend to show how well certain purchase complexity proxies explain people's mental accounting opportunities. The measures used for this are the same as the mental accounting proxies in H1, currently tested at an individual level. I want to create more grouped testing for this. Further tests look at vehicle values as proxy for purchase complexity, though this is not ideal. I want to create a better set for this by filtering on other variables that are available.

The tests that have been done for this hypothesis so far show that each mental accounting proxy (except for *beschryf*) is significantly affected by respondents who indicate they own a car, suggesting that this is an indicator for a certain level of mental accounting. *Loan2* showed a result across all vehicles, increasing the estimate size as the vehicles become more involved (at the scale of usage specificity of car -> motorbike -> boat -> caravan). Thus, being able to obtain a loan seems to be a good indicator for likelihood of owning these vehicles (likely as it is a decent proxy for financial health, as suggested before). *Hoevspa* also shows positive significant results for car and boat ownership, further reinforcing this idea. Testing over the vehicles' value (car & caravan, as the categories for the other vehicles did not have enough responses) did not show any differences between value levels and the mental accounting proxies. It did however reinforce the idea that people with car ownership are more motivated to save and keep better track of expenses. Further testing of this hypothesis needs to be done, in the ways I mentioned before. Further I also want to find a way to test for smaller purchases, as I currently only have tests between large purchases (which could still be scored on a utilitarian-luxury scale). Overall I need to find a better way to show purchase complexity, as this is currently lacking. I want to find better proxies for this in literature and see if I can identify similar things in my dataset.

#H3:

Current tests for H3 show that respondents' financial situation is an important explanatory variable for the mental accounting proxies. I have not been able to do much further testing on this hypothesis yet. My plan is to find more proxies for budgeting skill and to test these on promising indicators of financial distress. I have some noted down that I can test soon, though I think I will also have to go back to the dataset to see if I can bind some variables together to get measures that can provide more insight.

Issues, future plans and questions

I spent quite some time figuring out which analysis method to use, and am still not 100% satisfied with my overall analysis. However, due to the lost time from motivational problems/work anxiety due to Corona, and the time I have to spend on the upcoming exams (further reducing the time I can spend on my thesis), I would like to request a two week extension on the final turn-in date. This would give me enough time to fully flesh out my analysis and allow me to write it into a full thesis without becoming pressed for time and ending up with a lower quality thesis.

My plans for the next few weeks is to first focus on the two exams I have left (28th of May and 3rd of June). In this time I will likely still do some work on my thesis, mainly by looking for better way to organise & analyse my data. How long I can spend on this depends on whether my extension request is approved. In any case, I want to start writing around the start of June to allow enough time for this process (~ 3 weeks at least).

To end, I have some questions I hope you could give me some insight on:

- 1) Do you know how the final turn-in of the thesis will work now that we cannot go to the Uni (though that may be changing soon)? Do we still have to turn in a hardcopy version as well, or will it just be an email + upload to Canvas?
- 2) I am somewhat worried about my research choice after seeing surveys sent to me by my fellow Masters students and thesis writers. I set out on this research as I wanted to challenge myself and do research with a data type and research method I had not seen before, which obviously came with some trial and error and scrapping ideas. The surveys I see from others, however, sometimes seem to be simplistic and inspired by work we've done in other courses. I fear that I might be reducing my chances at a good result by doing something I have not seen before, and that my effort towards this thesis is not recognized if my final product is not as sophisticated as expected. In that case, I would have been better off trying to replicate something I had already seen in one of my courses to make sure I could create clean and correct research. I hope you can explain to me if there is any logic to my thoughtprocess here, or if I am worrying for no reason.