Appendix 1: Questionnaire form used for my survey

My name is Jana Kahounová and I would like to ask you to fill in the following questionnaire. Its purpose is to collect data for my diploma thesis which tackles the issue of the Czech pension reform. Since collecting data is rather difficult, I would be very grateful for every completed questionnaire. At the same time, I'm asking you to provide answers as truthful as possible so that my research can present the most possible realistic results. Filling in the questionnaire is anonymous!
Thank you beforehand for your time!

1. Your age: _____

2. You are:
   a) a woman
   b) a man

3. The level of education you achieved:
   a) unfinished basic education
   b) basic education
   c) secondary education
   d) upper secondary education
   e) higher education
   f) university education

4. Your current economic status:
   a) employee
   b) self-employed
   c) on maternity leave
   d) student
   e) retiree
   f) unemployed

5. Do you think that your current and planned reserves for retirement will be sufficient?
   a) yes
   b) no
   c) I don't know.

6. Are you creating some financial reserves for retirement?
   a) yes
   b) no
   c) I don't know.

7a. Only the persons who do create financial reserves for old age are invited to fill in:

How do you create financial reserves for old age? (You can denote more options.)

a) Czech building saving scheme (“stavební spoření”)
b) saving (in general)
c) supplementary pension scheme (“penzijní připojištění”)
d) life insurance scheme
e) investments in stocks, funds and bonds
f) property investments
g) others

7b. Only the persons who do not create financial reserves for old age are invited to fill in:

Why do you not create financial reserves for retirement? (You can denote more options.)

a) Cannot afford to save for retirement.
b) I'm already retired.
c) There is no need to save for retirement.
d) I still have enough time to begin saving for retirement.
e) I think that the state pension will be enough.
f) I haven't thought about it yet.
g) Other reason

7. You are about to obtain an amount of money. Which alternative would you choose?
   a) To obtain CZK 1000 immediately
   b) To obtain CZK 1020 a month later

8a. In case that you have chosen the option to obtain CZK 1000 immediately:

Please write down what minimal amount of money would you require to obtain a month later to be willing to prefer the reward delayed by one month?: ____________________________

8. You have deposited CZK 100 on your savings account and the interest is 2 % p.a. How much money would be on the bank account in 5 years?
   a) more than CZK 110
   b) exactly CZK 110
   c) less than CZK 110

9. How to reduce risk when investing into shares?
   a) by buying more different types of shares
   b) by buying shares that increased the most last year
   c) by buying shares of companies from one field of business

10. Interest rate on the savings account is 1 % p.a. and yearly inflation is 2 %. After a year, if you spend money from savings account, you will buy:
   a) more than you would buy a year ago
   b) the same as you would buy a year ago
   c) less than you would buy a year ago

11. You are about to obtain an amount of money. Which alternative would you choose?
   a) To obtain CZK 1000 a year later
   b) To obtain CZK 1020 a year and a month later

   12a. In case that you have chosen the option to obtain CZK 1000 a year later: Please write down what minimal amount of money would you require to obtain a year and a month later to be willing to prefer the reward delayed by one month?: ____________________________

12. **Now please choose - always HYPOTHETICALLY - the options concerning the pension reform scheme that you would prefer yourself.**

   At the present time the pension's insurance rate is 28 % of the assessment base calculated from your gross wage - by paying this fee you contribute compulsorily to the pay-as-you-go public pension system from which you will receive the state pension.

   The pension reform will introduce the possibility to release 3% from the 28 % insurance rate and to save these percents to private pension funds on condition that the contribution will be increased by another 2 %. Let's presume that the minimum yield of the pension funds begins at 1.5 % a year. If you also decide to save up to pension funds and if during the saving period your average gross income is higher or equals CZK 20 000, when you're retired your income will be higher than if you pay the pension insurance only.

   Having considered the suggested options what kind of pension savings would you prefer?
   a) pension insurance only
   b) pension insurance + saving up to pension funds

      12a. Fill in the case that you would also prefer the possibility to save up to pension funds:

      What is the amount of a monthly contribution to pension funds that you would prefer?

a) Minimum 5% of the assessment base, but I can always choose a higher monthly contribution.
b) Automatic increase: the initial amount is 5% of the assessment base with the automatic increase of the contribution by another 1 % with every increase of the wage by min. 2 %. This is how the contribution can rise up to its maximum limit that I fix myself. However, I can always choose another amount of the contribution, but always minimally 5%.

12b. Fill in the case that you would also prefer the possibility to save up to pension funds:

What is the possibility of access to deposits in pension funds that would suit you better? Please rank the stated options downwardly according to your preferences from 1 = the most suitable to 4 = the least suitable.

Option	Please match the individual options to the figures 1, 2, 3 and 4
a) It is possible to withdraw the deposits whenever I ask for it.	
b) First I fix the amount that I want to save up in the funds and then once my savings reach the fixed amount, I can withdraw the deposits. (in case of a premature death the saved money is subject to inheritance proceedings)	
c) First I fix the date when I can withdraw the money. I can withdraw it only after this date. (in case of a premature death the deposits is subject to inheritance proceedings)	
d) It is possible to start withdrawing the deposits after having met the requirements for the entitlement to receive old-age pension. (in case of a premature death the saved money is subject to inheritance proceedings)	

13. What kind of entry into the private funded scheme would you prefer?

a) Automatic enrolment into the private funded scheme: Every person who pays social security insurance will automatically enter in a pension fund with an already set up investment profile with the lowest risk. It is possible to change the investment profile anytime and the pension fund only one time. In case that I do not want to save money into pension funds, I can cancel the account anytime till the deadline defined by law.

b) Voluntary enrolment into the private funded scheme: Every person makes his own decision if he wants to save up to pension funds. On the basis of this decision she/he will open a savings account in pension funds with the chosen investment profile. The decision can be made until the deadline defined by law.

Appendix 2: Model with heteroskedastic standard errors

We consider OLS regression in the form

$$y = X\beta + u \qquad \text{(App. 2.a)}$$

OLS estimator of β is

$$\hat{\beta} = \left(X'X\right)^{-1} X'y . \qquad \text{(App. 2.b)}$$

Under assumptions that error terms are independently and identically distributed (*iid*), the covariance matrix of the error terms is

$$\Omega = E(uu') = \sigma^2 \mathrm{I} \qquad \text{(App. 2.c)}$$

where σ^2 is the variance common for the errors.

Variance of the OLS estimator can be thus computed as

$$Var\left(\hat{\beta}\right) = E\left(\left(\hat{\beta} - \beta\right)\left(\hat{\beta} - \beta\right)\right) = \left(X'X\right)^{-1} X'\Omega X \left(X'X\right)^{-1} = \sigma^2 \left(X'X\right)^{-1} \qquad \text{(App. 2.d)}$$

If the *iid* assumption is not satisfied, the standard errors expressed as the square roots of the diagonal elements of the matrix given by (App. 2.d) are not correct and should not be used to perform tests or form confidence intervals. Deviation from iid assumption is most likely caused by heteroskedasticity, it is also the case of microeconomic data that I deal with[1].

White (1980)[2] proposed remedy of this bias by so-called heteroskedastic-consistent estimate of the variance matrix expressed as

$$V\hat{a}r_h\left(\hat{\beta}\right) = \left(X'X\right)^{-1} X'\hat{\Omega} X \left(X'X\right)^{-1} \qquad \text{(App. 2.e)}$$

where $\hat{\Omega}$ is a diagonal matrix whose non-zero elements are estimated using squared OLS residuals. This estimator retains its validity, at least asymptotically, despite heteroskedasticity, and leads to heteroskedasticity-robust standard errors.

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[1] Heteroskedasiticity was not rejected by White‘s test and Breusch-Pagan test

[2] White, H. (1980) A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, Econometrica, Vol. 48, No. 4, pp. 817-838

White defined assumptions under which OLS can be consistent despite heteroskedasticity of the disturbances. The assumptions were summarized by Cameron, Trivedi (2005):

1. The data (y_i, x_i) are independent and not identically distributed (*inid*) over *i*
2. The model is correctly specified so that

$$y_i = x_i'\beta + u_i \qquad \text{(App. 2.f.1)}$$

3. The regressor vector x_i is possibly stochastic with finite second moment, additionally $E\left[\left|x_{ij}x_{ik}\right|^{1+\delta}\right] \leq \infty$ for all $j,k = 1,...,K$ for some $\delta > 0$, and the matrix $\mathrm{M_{XX}}$ defined as

$$\mathrm{M_{XX}} = p\lim N^{-1}X'X = p\lim \frac{1}{N}\sum_{i=1}^{N} x_i x_i' = \lim \frac{1}{N}\sum_{i=1}^{N} E[x_i x_i'] \qquad \text{(App. 2.f.2)}$$

   exists and is a finite positive definite matrix of rank K. Also, X has rank K in the sample being analyzed.

4. The errors have zero mean, conditional on regressors

$$E[u_i \mid x_i] = 0 \qquad \text{(App. 2.f.3)}$$

5. The errors are heteroskedastic, conditional on regressors, with

$$\begin{aligned} \sigma_i^2 &= E[u_i^2 \mid x_i] \\ \Omega &= E[\mathrm{uu'} \mid \mathrm{X}] = Diag[\sigma_i^2] \end{aligned} \qquad \text{(App. 2.f.4)}$$

   where Ω is and $N \times N$ positive definite matrix. Also, for some $\delta > 0, E\left[\left|u_i^2\right|^{1+\delta}\right] < \infty$.

6. The matrix $\mathrm{M_{X\Omega X}}$ defined as

$$\begin{aligned} \mathrm{M_{X\Omega X}} &= p\lim N^{-1}X'\mathrm{uu'}X = p\lim \frac{1}{N}\sum_{i=1}^{N} u_i^2 x_i x_i' = \\ &= \lim \frac{1}{N}\sum_{i=1}^{N} E[u_i^2 x_i x_i'] \end{aligned} \qquad \text{(App. 2.f.5)}$$

   exists and is a positive definite matrix of rank K, where

   $\mathrm{M_{X\Omega X}} = p\lim \frac{1}{N}\sum_{i=1}^{N} u_i^2 x_i x_i'$ given independence over *i*.

   Also, for some $\delta > 0, E\left[\left|u_i^2 x_{ij} x_{ik}\right|^{1+\delta}\right] < \infty$ for all $j,k = 1,...,K$

Appendix 3: Probit model

We consider the variable y_i and analyze its distribution conditional to the explanatory variables x_i. That is

$$y_i = \begin{cases} 1 & P_i \\ 0 & 1 - P_i \end{cases} \qquad \text{(App. 3.a)}$$

where $P_i = (y_i = 1 | x_i)$

In case of probit, the function P_i is a cumulative distribution function of the normal distribution. Thus we have

$$P_i = F(z_i) = \Phi(z_i) \qquad \text{(App. 3.b)}$$

where z_i is the index function

$$z_i = \sum_{j=1}^{k} x_{ij} \beta_j \qquad \text{(App. 3.c)}$$

Due to its specification, estimation of probit coefficients is usually by the maximum likelihood method.

The interest lies in determining the marginal effect of change in the regressor on the conditional probability that $y = 1$, this is

$$\frac{\partial P(y_i = 1 | x_i)}{\partial x_{ij}} = \frac{\partial F(z_i)}{\partial x_j} = \Phi(z_i)\beta_j \qquad \text{(App. 3.d)}$$

Since the marginal effects differ with the point of evaluation x_i, instead average marginal effects are computed.

We use the following formula:

$$slope_j(\bar{x}) = \frac{\partial F(z)}{\partial x_j}|_{z=\bar{z}} \qquad \text{(App. 3.e)}$$

There are three assumptions of probit estimation:

1. Dependent variable is a binary variable.
2. The error terms are normally distributed.
3. Explanatory variables are not collinear.

Appendix 4: The alternative estimation techniques for analyzing the time discounting correlates

Estimator	Interval regression with robust standard errors		Ordered probit	
Explanatory variables	Dependent variable			
	Current discount rate	**Future discount rate**	**Current discount rate**	**Future discount rate**
Intercept	1.1627 * (0.6672)	1.4428 * (0.7948)		
Female	0.1682 (0.1310)	0.1027 (0.1600)	0.3175 *** (0.0968)	0.1669 * (0.0996)
Age	0.0306 (0.0341)	0.0449 (0.0373)	-0.0210 (0.0202)	-0.0222 (0.0209)
Age^2	-0.0004 (0.0004)	-0.0007 (0.0004)	0.0002 (0.0002)	0.0002 (0.0002)
Financial knowledge	-0.3111 ** (0.1543)	-0.3757 ** (0.1757)	-0.2632 *** (0.0705)	-0.2559 *** (0.0722)
Level of education	-0.2821 ** (0.1310)	-0.2601 * (0.1550)	-0.2258 *** (0.0702)	-0.1484 ** (0.0719)
Student	0.2287 (0.1476)	-0.0943 (0.1895)	0.1063 (0.1427)	-0.2083 (0.1487)
Retired	0.9752 * (0.5540)	0.8982 * (0.5202)	0.2826 (0.2142)	0.3231 (0.2220)
Self-employed	-0.1396 (0.1199)	-0.1049 (0.2562)	-0.0709 (0.1805)	0.0177 (0.1816)
Sample size	540	540	540	540
Log-likelihood	-2210.897	-2431.449	-769.244	-737.994

Level of significance: * 10%; ** 5%; *** 1%