Pre-Analysis Plan:
The Currency Co-Holding Puzzle*

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13th December 2024

*The opinions expressed do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or the Eurosystem.

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1 Introduction

It is common in different countries worldwide that people do not only utilize the local currency of the country they are living in but might also rely on foreign currencies. Sometimes people hold foreign currency cash and deposits, for example, as a means of saving, and sometimes they borrow in foreign currency. Foreign currency usage is also very common in some economies in Central, Eastern and Southeastern Europe, where especially the euro is used next to local currencies.

The reasons for using foreign instead of local currency are manifold and the reasons to save in foreign currency are not necessarily the same as to borrow in it. Still, in this project, I conceptualize the joint decision in which currency to save and in which to borrow: in local or foreign currency. I coin this decision *currency co-holding*. Using an international survey, I look at which co-holding combinations are common among which socio-demographic groups, i.e. to which individual characteristics they are correlated to.

I am especially interested in the role of trust, risk tolerance and financial literacy, in particular the knowledge about potential risks stemming from foreign currency loans (FX-literacy). First data for the project were already collected in the 2022 wave of the survey. To uncover a potential causal channel from FX-literacy to currency co-holding preferences, I additionally conduct an information experiment in the current wave of the survey, which is in field in fall 2024.

The experiment intends to vary the knowledge about exchange rates and the potential risks arising from an exchange rate depreciation. After answering several financial literacy questions, including one on exchange rate literacy, survey participants are randomized into either getting further information on exchange rates or not. Subsequently, they are asked whether they would prefer to deposit money in local or foreign currency and in which currency they would prefer to borrow. In addition, they are asked about potential motives to borrow in a certain currency, depending on the choice they have made before.

This pre-analysis plan only outlines the survey experiment of the research project, including the hypotheses and power estimations for the information treatment.

2 Research question and implementation

2.1 Data

I implement the experiment within the OeNB Euro Survey, an annual survey, covering overall nine countries in Central, Eastern and Southeastern Europe. The survey sets a focus on euroization. Therefore, it is conducted in countries that do not have the euro as official currency but where the use of the euro and other foreign currencies was or is still common. The questionnaire always includes a standard set of questions on foreign currency usage but also questions about the general financial situation of respondents. Moreover, personal attitudes and characteristics that were identified by the literature to be correlated with foreign currency usage are elicited. This includes negative financial experiences, financial expectations, trust indicators and financial literacy.

Data for the 2024 wave, in which the experiment is embedded[1], were collected in October/November. However, as usual, data quality checks from the survey institute, which is in charge of conducting the survey in field, are still ongoing. As part of the project team at the Austrian Central Bank, on which behalf the survey is conducted, I will receive the data the earliest at 16th December.

Due to resource constraints, the experiment is conducted only in three of the nine countries: Czechia, Poland and Serbia. The sample size per survey wave is about 1,000 respondents per country and predetermined by the Austrian Central Bank. Respondents are selected with a multi-stage sampling procedure to ensure representativeness.[2] All interviews are interviewer-led and conducted face-to-face. Tablets are used for all interviews, except in Poland, where about 20% of the interviews are conducted with pen and

[1] The questionnaire includes another information experiment on deposit insurance and the willingness to save in the bank instead of in cash, which is described in Beckmann and Meyer (2024). I have no reason to believe that the two experiments are interfering with each other in a systematic way. The treatments are randomized such that a respondent either gets more information in this experiment or in the other to avoid information overload.

[2] However, due to heavy flooding in Czechia and Poland, representativeness might be reduced there, as not all regions could be surveyed and response rates in general might have decreased. The questionnaire includes questions on how respondents were affected by the floods. These questions might be used to assess data quality and for balance tests.

paper. Randomization works slightly different in each country but is always stratified by interviewer (the randomization mechanisms are explained in Beckmann and Koch, 2024).

The three countries considered are euroized to a very different extent which makes them interesting points of comparison. While in Serbia, the share of euro assets within the portfolio of an average individual was around two thirds in 2023, it was 10% in Poland and below 5% in Czechia. Similarly, 36% of borrowers in Serbia reported to have a foreign currency loan, whereas only 5% in Poland and not even 1% in Czechia did so in that year. In terms of preferences, the average person (which is not the same as the average asset holder or borrower) in Czechia and Poland more often prefers foreign currency deposits and in Czechia also more often foreign currency loans than the actual numbers would tell.

2.2 The research project

The overall research project mainly explores the impact of three factors on currency co-holding: trust, risk tolerance and FX-literacy. Initial data were collected in the 2022 wave of the OeNB Euro Survey. The data show first that there is indeed a variation in currency preferences. Figure 1 shows the share of each potential combination, separated by country. Some people always prefer local or always foreign currency for saving and borrowing, some people mix. The variation is clearly not random. For example, almost no one opts for the co-holding of local currency deposits and foreign currency loan.

Second, there is a correlation between currency co-holding preferences and FX-literacy, with a pattern that is similar across the three countries used for the experiment. Controlling for gender, age, education and income, those who are FX-literate are less likely to prefer local currencies only and except for those in Czechia, also less likely to prefer foreign currencies only; instead they are more likely to prefer foreign currency savings and a local currency loan. The generally disliked choice of local currency savings and foreign currency loan is mildly negatively related to FX-literacy.

Given this correlational evidence, I design an information treatment, which is supposed to vary exchange rate knowledge, to test if that knowledge impacts currency preferences.

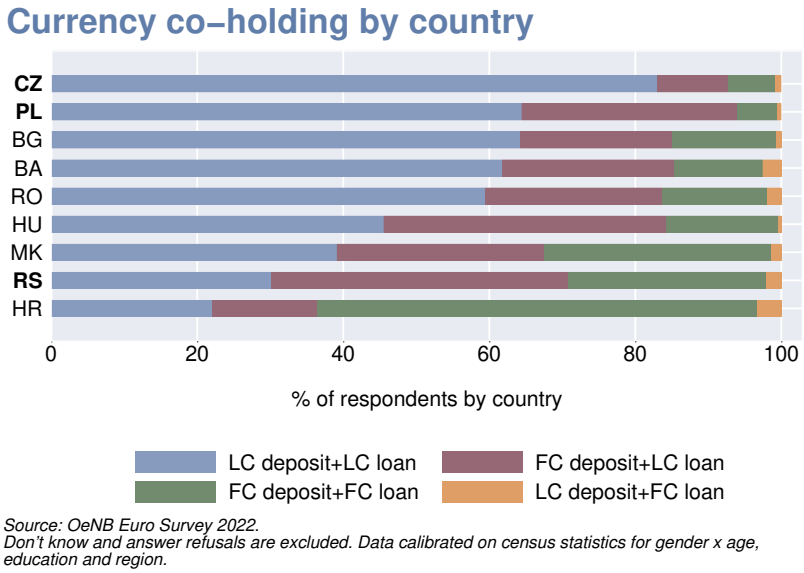

Figure 1: Simultaneous currency preference for deposits and loans

2.3 The experiment

2.3.1 The treatment

In every survey wave, the financial literacy of the respondents is elicited by using the so-called Big Three questions on financial literacy by Lusardi and Mitchell (2008). Additionally, a fourth questions was introduced to capture the knowledge of exchange rate risk. This is an important skill in countries, where the use of foreign currencies is common. It was shown with Euro Survey data that exchange rate knowledge is indeed a strong predictor of foreign currency borrowing (Beckmann and Stix, 2015). The question on exchange rate risk is asked last in the financial literacy block and reads as follows:

> Suppose that you have taken a loan in EURO. Then the exchange rate of the [LOCAL CURRENCY] depreciates against the EURO. How does this change the amount of [LOCAL CURRENCY] you need to make your loan installments?
> The amount of local currency...
>
> 1) increases
> 2) stays exactly the same
> 3) decreases

Like for all other questions, refusing to answer by saying "don't know" or "no answer" was permitted too. Like answer options 2 and 3, these refusals count as wrong answers. I use the FX-literacy question as starting point for the experiment. Respondents are randomized into two groups and depending on the group, receive a different follow-up question and with this different information. The control group is asked how they would assess their knowledge on exchange rates themselves:

Control group
The exchange rate captures how much [LOCAL CURRENCY] you need to exchange it for another currency. What would you say, how clear is the concept of exchange rates to you? Please use a scale from 0 to 10, where 0 means "the concept is very unclear" to you and 10 means "the concept is very clear" to you.

In contrast, the treatment group first gets a more detailed explanation what an exchange rate is and then, is asked how they would assess their knowledge themselves too. Moreover, the introduction of the explanation differs for those who got the previous exchange rate literacy question right and those who got it wrong:

Treatment group
Your answer to the last question was perfectly right.* The exchange rate captures how much [LOCAL CURRENCY] you need to exchange it for another currency. When the [LOCAL CURRENCY] depreciates against another currency, it loses value. Therefore, you need more [LOCAL CURRENCY] than before to exchange it for one unit of the other currency. In turn, when the [LOCAL CURRENCY] appreciates against another currency, it gains value. And therefore, you need less [LOCAL CURRENCY] than before to exchange it for one unit of the other currency.

What would you say, how clear is the concept of exchange rates to you?

1) Very clear
2) Clear
3) Unclear
4) Very unclear

*Only if FX-literacy question was answered correctly before

The slight difference is introduced so that people who got it right are not confused about why they now learn about what an exchange rate is. Another reason it that the affirmative statement emphasizes to those respondents that they are indeed knowledgeable. If power allows it, I want to look at different treatment effects between those who learn that they were indeed correct and those who did not.[3]

The explanation itself is designed in such a way that it conveys the concept of exchange rates without priming people into either the savings or the borrowing frame but rather keeps a neutral frame. Moreover, it is relatively short to avoid interviewer fatigue (i.e. interviewers not reading out the full information) and respondent fatigue (i.e. respondents not listening to the full information).

The explanation is then connected to a question about the perceived knowledge. For the analysis, this perception is only of secondary importance. However, it is important for ensuring a proper implementation of the experiment. The question scale deliberately varies between treatment and control group to test if the treatment assignment worked correctly (see Beckmann and Koch, 2024).

2.3.2 Main outcome variable

After the intervention, the currency preferences for saving and borrowing are elicited. First, respondents are asked about depositing a hypothetical amount that roughly equals about two times an average monthly salary in a savings account. They are asked whether they would deposit the money in local or in any foreign currency. This question resembles a standard question of the survey, which is always asked in the beginning of the interview and which is also used in the 2022 wave. However, the standard question asked about local currency and different foreign currencies explicitly (Euro, US-Dollar, Swiss Franc or another foreign currency). Still, the repeated design would allow to test for within-effects

[3] Clearly, some people who answered the literacy question wrongly, still could think that they answered it correctly. Nevertheless, I prefer to only use positive and no negative feedback, as I am more interested in how people who think they are knowledgeable decide. People who know that they do not know, might be more reluctant to make any currency choices at all (refusing to answer is possible) and, in real life, delegate this decision to someone else.

in terms of saving.

Afterwards, respondents are asked in which currency they would borrow the same amount of money in case they had to borrow it from a bank. Also this question differs from the borrowing question asked in the 2022 wave in terms of asking about foreign currencies in general instead of asking for certain foreign currencies specifically. The exact wording of the two questions used in 2024 and the used amounts are shown in appendix subsection A.1. Out of the two questions, I construct a composite variable, which can be captured in a 2x2-matrix:

Table 1: Co-holding choice (composite of hypothetical deposit and loan decision)

		Loans	
		Local currency	Foreign currency
Deposits	Local currency	1	4
	Foreign currency	2	3

The co-holding variable then takes four values, where 1 means that both deposits and loans are preferred to be held in local currency, 2 that deposits are preferred in foreign but loans in local currency, 3 that both are preferred in foreign currency and 4 that deposits are preferred to be held in local but loans in foreign currency. The main goal of the experiment is to analyze the effect of the treatment on this variable. Answer refusals to the preference questions are excluded (at least in the main part), although the treatment in principle could also impact the willingness to decide on any currency at all. However, the analysis of answer refusals is expected to suffer from too low power given the answer behavior in past survey waves.

2.3.3 Auxiliary variables

To better understand the motives behind currency co-holding preferences, and potentially how the treatment exactly changes preferences, I also ask respondents why they prefer

to borrow in local currency or foreign currency, depending on their previous choice. I only ask about the borrowing and not the saving decision because I expect it to be more malleable by the treatment. Answer options were mirrored if possible. This can provide evidence if different preferences are still based on the same motive.

If local currency loan is preferred
What is the main reason why you would borrow the amount in [LOCAL CURRENCY]?

1) The [LOCAL CURRENCY] is the official currency of [MY COUNTRY]
2) I trust the [LOCAL CURRENCY] more
3) Better loan conditions (better interest rate/ lower fees etc)
4) Foreign currency loans are too risky
5) It is not possible to borrow in foreign currency
6) Other reason

If foreign currency loan is preferred
What is the main reason why you would borrow the amount in foreign currency?

1) I believe that the [LOCAL CURRENCY] will be replaced by the euro soon
2) I do not trust the [LOCAL CURRENCY] enough
3) Better loan conditions (better interest rate/good exchange rate/lower fees etc)
4) Loans in [LOCAL CURRENCY] are too risky
5) Most/all of my income is denominated in a foreign currency
6) Other reason

Eventually, the last question of the experimental block is another question about exchange rate risk knowledge. It serves as soft check to see if the information treatment really changed knowledge.

What would you say, for someone who gets all their personal income in [LOCAL CURRENCY], is it less or more risky to borrow in foreign currency than in [LOCAL CURRENCY]?

1) Less risky to borrow in foreign currency
2) More risky to borrow in foreign currency
3) The risk is the same

The check is only soft as there is no perfectly correct answer to this question. However, if *risk* is understood only in a loss frame – as common –, thus as potentially running into higher credit costs or even repayment difficulties, ceteris paribus, it seems to be more prudent to borrow in the same currency in which the income is received (see Beckmann and Stix, 2015, for a discussion on the risk of foreign currency loans for unhedged borrowers). Still, if there are bail-outs, like foreign currency loans being transferred to local currency loans, in case of a strong exchange rate depreciation, the risk is muted. Additionally, the ceteris paribus assumption might be too strong. In depreciation crises, there might be a trade-off between exchange rate risk and interest rate risk pertaining to local currency loans (see Della Valle et al., 2018). Nevertheless, in the region I study, foreign currency loans are perceived as risky by official authorities (and turned out to be truly risky in the past) and therefore the access is often restricted.

3 Hypotheses

For the region under study, several studies outline the relationship between FX-literacy and the preference for foreign currency borrowing and savings respectively. For example, Della Valle et al. (2018) describe how the lack of financial literacy could lead to the underestimation of exchange rate risk and with this increases the preference for foreign currency loans. Beckmann and Stix (2015) exactly find empirical evidence for this channel. Brown and Stix (2015) postulate a positive relationship between financial literacy and foreign currency savings, which they empirically cannot confirm. However, they find that those people who are financially literate and at the same time expect their local currency to depreciate are more likely to prefer foreign currency deposits.

In general, theoretical work highlights how the combination of different financial expectations (in particular, inflation, interest rates and exchange rates expectations) and the general regional context influence the use of foreign currency, in particular if individuals decide rationally and in an optimal way (see the seminal work by Ize and Yeyati,

2003). Assuming that financial literacy is a prerequisite to optimal decision-making and expectation formation, hypotheses about its effect can be deducted from these analyses as well and also can explain the aforementioned empirical results.

Altogether, the theoretical and empirical literature predicted a certain pattern for countries in Central, Eastern and Southeastern Europe, which is still valid nowadays: FX-literacy should increase the preference for foreign currency savings and should decrease the preference for foreign currency loans. This is also confirmed again by the data I collected in 2022. Those with higher FX-literacy more often prefer foreign currency savings and a local currency loan. Accordingly, hypotheses H1-0 and its alternative, onesided hypothesis H1-a are:

H1-0: The share of respondents who prefer foreign currency savings and at the same time a local currency loan is equal in the treatment and in the control group.

(H1-a: The share of respondents who prefer foreign currency savings and at the same time a local currency loan is higher in the treatment than in the control group.)

If the share of one of the four co-holding options increases, other shares necessarily must go down; however, not all to the same extent. Exchange rate knowledge might impact savings differently than loans. In the wake of the Great Financial Crises, the risk of foreign currency loans strongly materialized in the region and many households were hit by the swift depreciation of their local currencies. In contrast, the asset side in the three countries was less affected by recent disruptions. Additionally given that losses tend to loom larger than gains, I expect the potential issue with foreign currency loans to be more salient and thus, that the treatment more strongly impacts the loan preference. In turn, I expect that the share of people who prefer local currency only decreases less than the share of people who prefer foreign currency only:

H2-0: The treatment-induced decline in the share of respondents who prefer local currency savings and local currency loans is the same as the decline in the share of those who prefer foreign currency savings and foreign currency loans.

(H2-a: The treatment-induced decline in the share of respondents who prefer local currency savings and local currency loans is smaller than the decline in the share of those who prefer foreign currency savings and foreign currency loans.)

The three countries are treated independently for hypotheses 1 and 2. Therefore, this gives us six, onesided hypotheses to be tested. One reason to treat the countries independently is the clear difference in foreign currency usage and preferences. The contrast is especially stark for the share of people who like foreign currency savings and local currency loans. Therefore, I also formulated a third hypothesis regarding differential treatment effects for this share across the countries. I suppose the treatment to work the better the higher the initial share is, thus the effect should be strongest in Serbia and weakest in Czechia.

H3-0: The treatment-induced increase in the share of respondents who prefer foreign currency savings and at the same time a local currency loan is the same in all countries.

(H3-a: The treatment-induced increase in the share of respondents who prefer foreign currency savings and at the same time a local currency loan is the stronger the larger the initial share was in a country.)

Eventually, I will also explore if and how the treatment impacts the main reason to borrow in local or foreign currency. However, since the focus of the experiment is on changing the actual preference and not necessarily the motive, I do not include hypotheses on the motives in this pre-analysis plan.

4 Estimation

Suppose *treat* is a binary indicator that equals 1 if a respondent belongs to the treatment group and 0 if the respondent belongs to the control group. For individual $i = 1, .., N_c$ in country $c \in \{CZ, PL, RS\}$, y_{ci} is the currency co-holding choice which takes values from 1 to 4. Thus, $y_{ci} = 2$ if an individual prefers foreign currency savings and a local currency loan, which is the outcome of interest for hypotheses 1 and 3. Relevant for hypothesis 2 are $y_{ci} = 1$ – an individual prefers local currency savings and a local currency loan – and $y_{ci} = 3$ – an individual prefers foreign currencies only.

For all hypotheses tests, I use regressions in which I control for interviewer characteristics (J_{ij}, where j $\in \{1, 2, 3, 4\}$), which include age ($j = 1$), gender ($j = 2$), education ($j = 3$) and Euro Survey interview experience ($j = 4$). Standard errors ϵ_i are clustered by NUTS-3-region. Given that all alternative hypotheses are onesided, I use onesided significance values.

4.1 Hypothesis 1

For each country c, I test for the equality of proportions of $y_{ci} = 2$ by *treat*:

$$\ln \frac{P(y_{ci} = 2|treat_i, \sum_{j=1}^{4} J_{ij})}{P(y_{ci} \neq 2|treat_i, \sum_{j=1}^{4} J_{ij})} = \alpha + treat_i'\beta + \sum_{j=1}^{4} J_{ij}'\gamma_j + \epsilon_i, \quad \forall c \in \{CZ, PL, RS\} \tag{1}$$

I reject hypothesis 1-0 for the specific country, if the *treat* coefficient (β) is significant.

4.2 Hypothesis 2

For the second hypothesis, I compare the *treat* coefficients (β) from two separate logit regressions, again for all countries separately:

$$\ln \frac{P(y_{ci} = 1|treat_i, \sum_{j=1}^{4} J_{ij})}{P(y_{ci} \neq 1|treat_i, \sum_{j=1}^{4} J_{ij})} = \alpha + treat_i'\beta + \sum_{j=1}^{4} J_{ij}'\gamma_j + \epsilon_i, \quad \forall c \in \{CZ, PL, RS\} \tag{2}$$

$$\ln \frac{P(y_{ci} = 3|treat_i, \sum_{j=1}^{4} J_{ij})}{P(y_{ci} \neq 3|treat_i, \sum_{j=1}^{4} J_{ij})} = \alpha + treat_i'\beta + \sum_{j=1}^{4} J_{ij}'\gamma_j + \epsilon_i, \quad \forall c \in \{CZ, PL, RS\} \tag{3}$$

I reject hypothesis 2-0 for a country, if the two βs are significantly different from each other.

4.3 Hypothesis 3

To test this hypothesis, I use a similar regression as for hypothesis 1. However, I pool the observations from all countries and add country dummies (C_{il}, where $\mathrm{l} \in \{0, 1, 2\}$ for CZ (l=0), PL (l=1) and RS (l=2). Most importantly, I add two interaction terms between the treatment and living in Poland or Serbia (this means Czechia is the baseline):

$$\ln \frac{P(y_{ci} = 2|treat_i, \sum_{j=1}^{4} J_{ij}, \sum_{l=0}^{2} C_{il})}{P(y_{ci} \neq 2|treat_i, \sum_{j=1}^{4} J_{ij}, \sum_{l=0}^{2} C_{il})} = \alpha + treat_i'\beta + \sum_{l=1}^{2} C_{il}'\delta_l + (treat_i C_{i1})'\zeta + (treat_i C_{i2})'\eta + \sum_{j=1}^{4} J_{ij}'\gamma_j + \epsilon_i \quad (4)$$

If the two interaction coefficients (ζ and η) are significant and significantly different from each other, I reject this hypothesis.

4.4 The treatment as instrument

If the treatment indeed induces a change in preferences (and knowledge), I will use it as an instrument for FX-literacy in the analysis of the overall research project. In this analysis, I regress the currency co-holding preference on FX-literacy, trust, risk tolerance, and additional control variables like socio-demographic characteristics, experiences and financial expectations.

5 Power

As previously mentioned, the predetermined sample size in each country is around 1,000 people. All respondents get the FX-literacy question, are either assigned to control or treatment and then get the two questions about the currency co-holding preferences. However, respondents can refuse to answer the preference questions and I can only use

observations that answered both questions. Therefore, the final sample size is probably less than 1,000.[4] As response benchmark to calculate the power, I use the data from the 2022 wave. The 2022 data moreover set the benchmark for the shares of each co-holding option that is preferred by the people, assuming that the slight change in questions does not change the shares tremendously. In contrast to the shares reported in figure 1, I use the unweighted numbers here.

Table 2 shows the unconditional minimum detectable effect (MDE) for the three co-holding outcomes used in the estimations, given the data from 2022, a power of 80% and an alpha of 5%. Given that all outcomes I analyze are shares, I use proportion power tests. Thus, the MDE is the minimum detectable change in percentage points. Tests are onesided as per the hypotheses. Expected sample sizes and shares for the control group are reported too.

Table 2: Summary power statistics for the currency co-holding options

	CZ	PL	RS
Sample size, expected	946	846	984
Sample size control, expected	473	423	492
Sample size treatment, expected	473	423	492
Share FC deposit + LC loan in control group	9%	27%	40%
Minimum detectable change	5.17 ppt	7.89 ppt	7.86 ppt
Share LC deposit + LC loan in control group	84%	67%	29%
Minimum detectable change	6.36 ppt	8.25 ppt	6.91 ppt
Share FC deposit + FC loan in control group	6%	6%	28%
Minimum detectable change	3.3 ppt	3.45 ppt	6.82 ppt

FC=foreign currency, LC=local currency. Sample sizes and shares for the control group are based on data from the 2022 OeNB Euro Survey wave. For the minimum detectable change, a power of 80% and an alpha of 5% are assumed.

[4] Another impacting factor might be the flooding. If some observations suffer from data quality issues, these will be removed from the dataset, as in previous waves. The flooding could increase such data quality issues. I am not involved in the data quality process for this survey wave.

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Appendix

A.1 Questions on currency preferences

Hypothetical savings

Now, we move away from the quiz questions and talk about your personal attitudes. Suppose again you had [COUNTRY-SPECIFIC VALUE*] to deposit in a savings account. Would you choose to deposit this amount in [LOCAL CURRENCY] or in a foreign currency like euros, US dollars or Swiss francs?

[LOCAL CURRENCY]
Foreign currency
Don't know
No answer

*Values: CZ-90,000 koruny; PL-14,000 złoty; RS-240,000 dinar

Hypothetical loan

Next, suppose you would want to borrow [COUNTRY-SPECIFIC VALUE*] from a bank. If you could choose, would you borrow this amount in [LOCAL CURRENCY] or in a foreign currency like euros, US dollars or Swiss francs?

[LOCAL CURRENCY]
Foreign currency
Don't know
No answer

*Values: CZ-90,000 koruny; PL-14,000 złoty; RS-240,000 dinar