HOUSEHOLD DEMAND FOR FOREIGN CURRENCY IN UKRAINE[*]

by

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Abstract:

Understanding the motives that lead people to switch from domestic to foreign currency is important for formulating monetary policies in transition economies. This paper presents a model of the demand for various financial assets by households in Ukraine, based on a portfolio balance approach. Based on the real conditions of the Ukrainian economic environment, it is assumed that households are restricted to four major types of financial assets: cash and bank deposit holdings in either domestic or foreign currencies, with an emphasis on cash holdings. As our econometric analysis shows, the exact structure of the portfolio chosen is determined by two sets of factors. In addition to the traditional variables such as the real income of households and the rates of return for each type of asset, there are important institutional factors like the credibility of the banking system, the expected stability of the economy, and the transaction costs associated with switches between currencies. The contemporary process of de-dollarisation observed in Ukraine, seems to be explained by the influence of institutional factors, especially by macroeconomic stability and the growth in the credibility of the commercial banks.

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1 Introduction

The initial stage of transformation of Ukraine's economy after the collapse of the Soviet Union was very painful. Macroeconomic instability, especially hyperinflation and a sharp devaluation of the national currency, the defaulting of the state banking system, and pervasive goods shortages created an atmosphere of uncertainty and distrust in any state obligations, including distrust in the domestic currency. Such distrust is also typical for Latin American countries, as well as other countries of Eastern Europe (Kamin & Ericsson, 2003). With increasing opportunity costs for holding national currency, households switched from domestic to foreign currency using the latter for savings and, whenever possible, for payments[3]. In Ukraine this switch became possible after the foreign exchange regime was liberalised in the early 1990s, which included a relaxation of the criminal aspects of holding foreign currency.

Here are some of salient facts about the economic history of Ukraine between 1991 and 1995 (Movchan, 2002):

o Between 1992 and 1995 the consumer price index increased by more than two thousand times.

o By the end of 1995 the cumulative net purchases of foreign currency by households amounted to USD 1.6 bn.

o From 1992 to the end of 1995 the share of households deposits in foreign currency had increased from 0% to 20%.

Macroeconomic stabilization, achieved in 1996, allowed introducing a new domestic currency. However, at the same time wage arrears and barter started to grow, leading to the conclusion that a hidden inflation in the form of arrears was replacing the observed inflation (Zhyliaiev & Movchan, 2000). The financial crisis of 1998 ended the economic stability. The national currency experienced a more than twofold depreciation within several months, and trust of households was lost again. A second period of macroeconomic stability started towards the end of 1999, when the nominal exchange rate of the hryvnia to the US dollar stabilised and the real GDP began to grow.

The basic question posed in this paper is what factors determined the currency choice of households in Ukraine since 1996, and consequently, what factors could bring about a reduction in the demand for foreign currency vis-à-vis the national currency. In this paper it is assumed that households have access to four types of financial assets: domestic cash, foreign cash, domestic-currency denominated bank deposits and foreign-currency denominated bank deposits.

The choice of households as the only economic agents in focus was dictated by several reasons. Firstly, households experience fewer legal limitations with cash transactions then enterprises do. This is important when the use of foreign currency[4]

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[3] In Ukraine, domestic currency is the sole legal means of payments.

[4] In the economic literature, two terms – dollarisation and currency substitution – are used to describe the phenomenon when foreign currency performs one or several functions of money in parallel with domestic currency. For different aspects of this phenomenon see, for instance, Mizen & Pentecost (1996), McKinnon (1996), Giovannini & Turtelboom (1994), Calvo & Végh (1992), Berg and Borensztein (2000), Sahay and Végh (1996), etc.

takes the form of cash substitution. Secondly, the available source for data on cash purchases is foreign exchange transactions in so-called kiosks, exchange points opened by companies that signed agency contracts with licensed banks (Curtis et al., 2001). It is assumed that households conduct the majority of transactions in these kiosks. Thirdly, households are closer to a defensive demand for foreign currency than enterprises that depend on their production structure (e.g. export or import orientation) for choosing the currency. Fourthly, households have almost the same access to financial assets as enterprises do. But the decision of households is less distorted by production or regulatory needs, and more likely based solely on the opportunity costs of the assets. All points mentioned above make households a very attractive object for research.

The paper is structured as follows. Section 2 provides an overview of existing studies regarding currency substitution in transition economies. The measurement question is considered in Section 3, and the Ukrainian situation is discussed in Section 4. Section 5 outlines the theoretical foundations for the research, while Section 6 presents the empirical results. Conclusions are given in Section 7.

2 Studies concerning the demand for foreign currency in transitional economies

Although the phenomenon of dollarisation in transitional economies has only recently captured the attention of international economic circles, there are several interesting studies devoted to this problem. Sahay & Végh (1996) analyse dollarisation in 15 countries including Eastern Europe and several republics of the former Soviet Union. They concluded that both the institutional environment and the macroeconomic situation determine the country-specific paths of dollarisation, and elaborated a classification of these countries in accordance with key features of the dollarisation process. A more recent study of dollarisation in transitional economies by Piontkivsky (2003) incorporates four post-Soviet republics and five post-socialist countries and links the dollarisation to the relative return on assets (deposits in different currencies) and the inflation volatility, i.e. the return and risk characteristics of financial assets denominated in domestic and foreign currency. He also explored the link between the development of a financial market and the level of dollarisation. Sarajevs' (2000) study of currency substitution in Latvia and Vetlov's (2001) study on dollarisation in Lithuania confirm the findings that the relative return on assets (measured as a return spread) allows explaining the choice of assets.

Mongardini & Mueller (1999) investigated currency substitution in the Kyrgyz Republic as a persistent phenomenon after the first shock of hyperinflation and liberalization of the foreign currency markets was over. However, a ratchet variable was not significant for explaining the patterns of currency substitution in their study. For Ukraine, this result was verified by Piontkivsky (2000) who did not find evidence for the existence of a hysteresis effect in the pattern of dollarisation in the country.

Among other studies of currency substitution in Ukraine, Volkov (2000) focuses on the basic determinants of currency substitution between 1994 and 98. According to the author, the period should be subdivided into two structurally different eras. From 1994

through the first half of 1996 currency substitution was basically determined by the expected depreciation, while thereafter (second half of 1996 to 1998) the foreign currency interest rate starts to dominate as the reason for currency substitution. Piontivsky (2000) also found that the real return differential had a significant influence on the level of dollarisation in Ukraine between 1998 and 99.

Curtis et al. (2001) emphasized another important aspect of currency substitution in Ukraine, namely the use of foreign currency in shadow economy transactions. They argued that the two different domestic currency regimes in the country, that is "the rouble zone and its aftermath" (1991-1996) and the managed exchange rate regime (1996 to the present), did not affect the demand for foreign currency because of the extensive shadow economy. The question arises whether official statistics like purchases of foreign currency in kiosks and bank deposits is relevant for a study of shadow transactions.

To summarize, various authors point to macroeconomic instability, revealed though hyperinflation, sharp devaluation, and a consequent shift of the "risk-return" balance towards foreign-currency assets, as the major reason for currency substitution in transition economies. These findings coincide with conclusions drawn for other countries (Ortiz (1983); Mizen & Pentecost (1996); Kamin & Ericsson (2003) *inter alia*). Consequently, macroeconomic stabilisation and the development of financial intermediation are suggested as cures for dollarization.

3   Measurement question

One of the most vital questions for this study is what financial assets to include in the research. The answer will determine both the reported scope of the currency substitution in the country and the results of the econometric estimates. The most conventional measure of currency substitution is the ratio of foreign currency deposits to broad money (Feige & Dean, 2002; Kamin & Ericsonn, 2003). This ratio could also be estimated as the ratio of foreign-currency denominated deposits to total deposits within the domestic banking system (Piontkivsky, 2000).

However, the conventional measure of currency substitution is not obviously the best. Currency substitution in the economy is often associated with economic instability, e.g. a history of bank confiscations (Feige & Dean, 2002). This means that households are often more than reluctant to hold their money in banks. This effect could also be caused by a poor development of the banking system or by legal restrictions associated with the holding of foreign currencies in banks. All that could make bank deposits inappropriate as a measurement instrument of the level of currency substitution in a country. Moreover, hyperinflation makes foreign cash not only a store of value and a unit of account, but also a medium of exchange. Definitely, the choice depends on the costs of the exchange transactions, i.e. their easiness, their availability, and the value of the transaction fee. But if these costs are not prohibitively high, economic agents could keep foreign currency and exchange it in case of need. That also underlines the role of cash substitution as an important part of currency substitution. In this case, a better measure of currency substitution will be the unofficial dollarisation index, proposed by

Feige & Dean (2002) and calculated as the ratio of foreign currency deposits in banks plus foreign cash over total bank deposits and currency in circulation.

Another form of financial asset, sometimes included in the studies, is foreign currency holdings abroad (Balino, 1999; Piontkivsky, 2000 *inter alia*). However, this category of financial assets was not included in this study, since it is assumed that households have very limited official access to international financial markets.

4   Household demand for foreign currencies in Ukraine

As mentioned above, households have access primarily to two forms of foreign-currency denominated assets, namely to cash and to commercial bank deposits. The share of foreign currency deposits at domestic banks has been increasing both for households and in the aggregate. The peak was reached in 2000, when half of all household deposits were foreign-currency denominated, thereafter the trend reversed (Figure 1). By the end of 2002, the share of deposits in foreign currency in all household deposits reclined to 40%. This means, if we consider this share to be a measure of currency substitution in the country, that Ukraine' households started to return to the domestic currency.

Figure 1
Household foreign-currency deposits at commercial banks in Ukraine

foreign-currency denominated deposits, cumulative UAH m (left scale)

% share of foreign-currency denominated deposits (right scale)
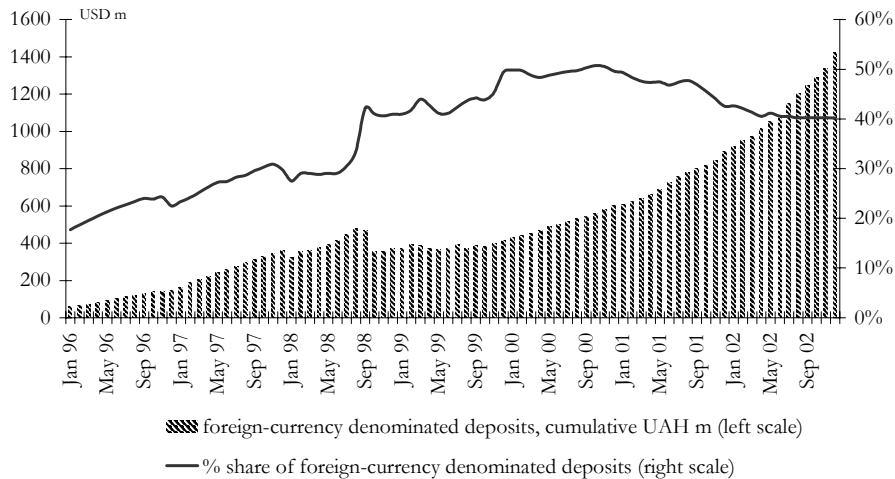
Source: National Bank of Ukraine

The development of a foreign cash market became an important aspect of foreign currency penetration in the economy. Since 1992, the State Committee for Statistics collects information on sales and purchases of foreign currency by households. It is based on data about operations with foreign currency at the cash market (exchange

kiosks) that presumably reflect the households' non-commercial transactions[5] (Figure 2). At this market, purchases of foreign currency basically dominated sales till the end of 1999. By the end of 2002[6], cumulative net purchases of foreign currency by households constituted approximately USD 4.6 bn. This stock was accumulated in the period between 1992 and the first half of 1999. Since then its growth has essentially stopped.

Figure 2
The foreign cash market in Ukraine, USD m
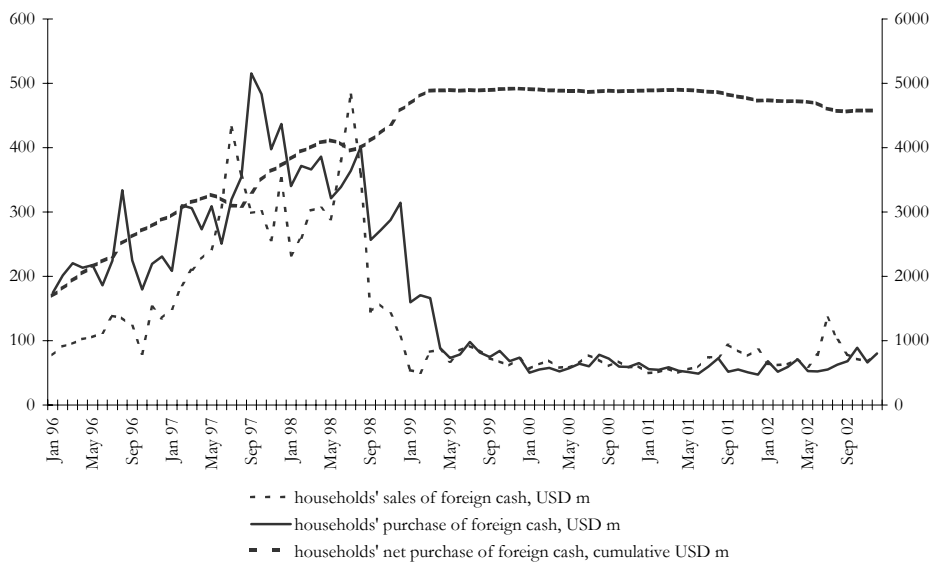
Source: UEPLAC, State Committee of Statistics

Thus, as can be seen at Figures 1 and 2, cumulative holdings of foreign-currency denominated assets started to decrease since the end of 1999, likely because of macroeconomic stabilisation and development of banking system. In empirical part of the paper, it is made an attempt to check this hypothesis.

5 Theory

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[5] Small entrepreneurs, shuttle traders whose operations are not officially registered, as well as part of the shadow economy transactions could also be reflected in the statistics.

[6] This sum covers the years 1992 to 2002 for which data are available. The plausible assumption is that the stock of foreign currency held by households before 1992 was small enough not to have any significant influence on the magnitude of the numbers. The reason for this assumption is that (a) in the Soviet Union keeping foreign currency at home was a crime, (b) access to foreign currency was very limited because of severe restriction on trips by citizens of the SU abroad, and (c) controlled foreign trade that was conducted through specially designated state agencies.

It is assumed that at each period of time when households receive income, they invest their disposable income either in cash or in interest-bearing assets. In Ukraine, bank deposits are chosen to invest in interest-bearing assets since the access to other forms of financial assets is rather limited. However, households can choose between domestic and foreign currency holdings, both for cash and bank deposits. Thus, the proposed model agrees with the unrestricted portfolio balance approach presented by Cuddington (1983), Mizen & Pentecost (1996), Alami (2001) *inter alia*. Households can choose between:

- Domestic currency (cash) at the end of each period M
- Foreign currency (cash) at the end of each period M^*
- Domestic-currency bank deposits at the end of each period D
- Foreign-currency bank deposits at the end of each period D^*

The choice of assets, expressed in real terms, depends on the real income of the households, the rate of return for each of these assets, as well as on specific variables associated with each asset (Mizen & Pentecost (1996)), that is:

$$\frac{M}{P} = m(y, r, r^* + x, x, \vec{h}) \tag{1.1}$$

$$\frac{D}{P} = d(y, r, r^* + x, x, \vec{h}) \tag{1.2}$$

$$\frac{EM^*}{P} = n(y, r, r^* + x, x, \vec{h}) \tag{1.3}$$

$$\frac{ED^*}{P} = f(y, r, r^* + x, x, \vec{h}) \tag{1.4}$$

Here P is the price level, E is the nominal exchange rate, y is the real income of households, and $\vec{h}$ is a vector of institutional variables. The rate of return on bank deposits in domestic currency is equal to the interest rate r. For foreign-currency denominated deposits, the rate of return is equal to the interest rate r^* adjusted by the depreciation of the domestic currency x. The rate of return on cash holdings is represented by the expected depreciation of the exchange rate x (Mizen & Pentecost, 1996). The expected depreciation of the domestic currency vis-à-vis a foreign currency leads to a drop in the demand for the domestic relative to the foreign currency, and visa versa.

Following Calvo (1985), it is further assumed that during each period of time every household holds a desired or individually "optimised" portfolio containing all four types of assets. The portfolio constraint (with W denoting the households' chosen portfolio) is

$$\frac{M}{P} + \frac{D}{P} + \frac{EM^*}{P} + \frac{ED^*}{P} = W \tag{1.5}$$

Thus, the shares of the respective financial assets in a portfolio are:

$$\theta_M + \theta_{M^*} + \theta_D + \theta_{D^*} = 1 \qquad (1.6)$$

Taking into account that the demand for each asset is restricted by the demand for the other three assets because of financial constraints, the relative demand functions can be derived from (1.6) as follows:

$$\theta_M = m'\left(y, r, r^*+x, x, \vec{h}, \vec{V}\right) \qquad (1.7)$$

$$\theta_D = d'\left(y, r, r^*+x, x, \vec{h}, \vec{V}\right) \qquad (1.8)$$

$$\theta_{M^*} = n'\left(y, r, r^*+x, x, \vec{h}, \vec{V}\right) \qquad (1.9)$$

$$\theta_{D^*} = f'\left(y, r, r^*+x, x, \vec{h}, \vec{V}\right) \qquad (1.10)$$

with $\vec{V}$ denoting vector of financial assets that could serve as complementary or substitute to considered financial asset.

The model is based on two suppositions:

Supposition 1. Due to institutional constraints, households cannot use foreign currency as a medium of exchange on the domestic market. In other words, domestic currency is the only legal means of payment. This supposition holds in Ukraine.

Supposition 2. An exchange of foreign cash against domestic cash is costly, and households receive income mainly in domestic currency. Thus, if households want to keep cash in the form of foreign currency to avoid domestic currency risks, they have to buy the foreign currency at kiosks or at commercial banks. When they want to buy goods afterwards, they have to exchange the foreign currency back, incurring transaction costs h^{tr}.

The expected signs of the partial derivatives are:

o *For real income*: $m'_y > 0, d'_y > 0, n'_y > 0, f'_y > 0$. Thus, an increase in real income is expected to raise the demand for all types of financial assets.

o *For the rate of return on domestic currency*: $m'_r < 0, d'_r > 0, n'_r < 0, f'_r < 0$. An increase in the rate of return on domestic currency deposits makes them more attractive, and hence, reduces the relative demand for alternative financial assets.

o *For the rate of return on foreign currency*: $m'_{r^*+x} < 0, d'_{r^*+x} < 0, n'_{r^*+x} < 0, f'_{r^*+x} > 0$. Conversely, an increase in the rate of return on foreign currency deposits makes them more attractive, and reduces the relative demand for deposits in domestic currency and in cash holdings.

o *For expected depreciation*: $m'_x < 0, d'_x < 0, n'_x > 0, f'_x > 0$. An expected depreciation of the domestic currency makes both holdings of cash and deposits denominated in domestic currency less attractive than foreign currency holdings.

In additional to the fairly traditional set of variable described above, the following institutional variables are also incorporated in this paper:

o *Expected stability of the economy* h^{stab} *:* Greater stability will directly and positively influence the demand for both domestic cash and bank deposits in domestic currency, and will indirectly increase the attractiveness of deposits in the banking system in general, assuming that its stability is positively correlated with stability of the economy: $m'_{h^{stab}} > 0, d'_{h^{stab}} > 0, n'_{h^{stab}} < 0, f'_{h^{stab}} > 0$.

o *Credibility of the banking system* h^{bank} *:* Credibility in the banking system is expected to positively influence the demand for any kind of deposit at commercial banks: $m'_{h^{bank}} < 0, d'_{h^{bank}} > 0, n'_{h^{bank}} < 0, f'_{h^{bank}} > 0$. Therefore, strengthening the banking system in the country is expected to promote the use of domestic currency and consequently, de-dollarisation of the economy.

o *Transaction costs of switching from foreign to domestic cash* h^{tr} *:* These costs are expected to negatively influence the demand for foreign currency, and positively the demand for domestic currency. The demand for bank deposits is expected to be indifferent to these costs: $m'_{h^{tr}} > 0, d'_{h^{tr}} = 0, n'_{h^{tr}} < 0, f'_{h^{tr}} = 0$.

6 Empirical evidence

6.1. Data

The paper covers the period from January 1996 to December 2002 using monthly periodicity. The data is taken from publications of the National Bank of Ukraine (NBU) and the State Committee of Statistics of Ukraine (SCS). In particular, household demand for domestic cash (*NCASH*) is approximated by the monetary aggregate M0, while household demands for bank deposits in domestic (*NDEP*) and foreign (*FDEP*) currencies are assumed to be equal to the actual household deposits at commercial banks. These data are collected by the NBU.

Household demand for foreign cash (*FCASH*) is measured by the net purchases of foreign currency by households at cash markets represented by kiosks. The pertinent statistics are provided by the SCS. All dependent variables are in real terms, and the respective portfolio shares (*SH-FCASH, SH_FDEP, SH_NCASH, SH_NDEP*) are estimated by equation (1.6).

The rate of return on bank deposits in domestic currency (*RETURN_NDEP*) is measured by the weighted average interest rate on household deposits in domestic currency (percentage per annum) published by the NBU. The rate of return on bank deposits in foreign currency (*RETURN_FDEP*) is the interest rate on household deposits in foreign currency (percentage per annum), for the years 1996-97 and 2000 approximated by the interest rate on deposits in foreign currency (percentage per annum) by legal entities and for other years measured directly. As a proxy for the expected depreciation of the domestic currency, a three-month moving average of the actual depreciation of the domestic currency (*MOV_AVER*) was used in this paper.

The institutional variables include proxies for the expected stability of the economy (*STABILITY* and *THRESHOLD*), the credibility of the banking system

(*CREDIBILITY*), and the transaction costs for operations with foreign currency at cash markets (*TRANS_COSTS*). As an estimate of the expected stability of the economy from the households' point of view, data on standard deviation of consumer prices inflation were employed in this paper. It is assumed that high inflation volatility is perceived as instability, and vice versa. Still another variable is *THRESHOLD*, which measures the impact of inflation when it exceeds a certain threshold following the idea employed by Christoffersen & Doyle (2000). In our paper this threshold was fixed at the level of 2% monthly inflation of consumer prices.

Households consider low credibility of the banking system a reason for switching from domestic to foreign currency. As pointed out by Feige and Dean (2001), dollarisation in the economy is often associated with economic instability, e.g. a history of bank confiscations. It means that households are often more than reluctant to hold their money in banks. This effect could also be caused by a poor development of the banking system or by legal restrictions, associated with holdings of foreign currency in banks. To measure bank credibility, the ratio of household deposits at commercial banks to GDP (*CREDIBILITY*) was used.

Finally, the transaction costs associated with foreign cash are approximated by the spread between the exchange rates for the purchase and sale of a foreign currency. This indicator (*TRANS_COSTS*) is constructed in line with *supposition 2*, according to which households exchange domestic for foreign currencies to avoid the inflation risk, and back to domestic currency to buy goods within a certain period of time. For this paper, this period was taken to be equal to three months. The transaction costs are negative when the spread between the purchase and sale prices of a foreign currency is greater than the depreciation of the national currency measured in absolute terms, and vice versa. Therefore, households gain from switching back and forth between currencies only when there is a period of rapid depreciation in the country. The transaction costs variable is constructed as dummy that is equal to unity when households incur losses, and zero otherwise.

6.2.   Methodology of the estimates

Within the framework of this study separate demand functions for all four types of financial assets were estimated by means of an auto-regressive distributed lag model. Each equation takes the form

$$A(L)Y_t = m + B_1(L)\vec{I}_t + \varepsilon_t \tag{1.11},$$

with L as a lag operator. Y is the dependent variable, $\vec{I}$ is a vector for explanatory variables. Hence, following Johnston et al. (1997):

$$A(L) = 1 - \alpha_1 L - \alpha_2 L^2 - ... - \alpha_p L^p \tag{1.12}$$

$$B(L) = \beta_0 + \beta_1 L + \beta_2 L^2 + ... + \beta_q L^q \tag{1.13}$$

Using the reparametrization procedure proposed by Johnston et al. (1997), equation (1.11) can be presented not solely in levels, but in levels and first differences. In this case, (1.12) and (1.13) become:

$$A(L) = 1 - \alpha_1 L - \alpha_2 L^2 - ... - \alpha_p L^p = A(1)L + (1-L)(1 + \gamma_1 L + \gamma_2 L^2 + ... + \gamma_{p-1} L^{p-1})$$
(1.14)

$$B(L) = \beta_0 + \beta_1 L + \beta_2 L^2 + ... + \beta_q L^q = B(1)L + (1-L)(\delta_0 + \delta_1 L + \delta_2 L^2 + ... + \delta_{q-1} L^{q-1})$$
(1.15)

which gives:

$$A(L)Y = \Delta Y_t + [A(1)Y_{t-1} + \gamma_1 \Delta Y_{t-1} + ... + \gamma_{p-1} \Delta Y_{t-p}]$$
(1.16)

$$B(L)\vec{I}_t = B(1)\vec{I}_{t-1} + \delta_0 \Delta \vec{I}_t + \delta_1 \Delta \vec{I}_{t-1} + ... + \delta_{q-1} \Delta \vec{I}_{t-q}$$
(1.17)

and (1.11) transforms into:

$$\Delta y_t = m + B(1)\vec{I}_{t-1} + \delta_0 \Delta \vec{I}_t + \delta_1 \Delta \vec{I}_{t-1} + ... + \delta_{q-1} \Delta \vec{I}_{t-q} - A(1)y_{t-1} - \gamma_1 \Delta y_{t-1} - ... - \gamma_{p-1} \Delta y_{t-p} + \varepsilon_t$$
(1.18)

This transformation offers several important features that simplify our calculations, namely:

- The coefficients of the lagged explanatory variables in levels after reparametrization (equation (1.18)) are the sum of the coefficients of the lagged explanatory variables in levels before reparametrization (equations (1.12) and (1.13)). Moreover, as shown in Johnston at el. (1997), after we leave out redundant lags, these coefficients remains meaningful.
- The p-values attached to the lagged levels after reparametrization are exactly the same as the p-values for Wald testing, when these sums are zero in the non-reparametrized equation.

In addition, the standard errors of regression, the information criteria, and the log-likelihood values are identical for the equations before and after reparametrization (Johnston et al., 1997).

The final number of lags in each case is chosen on the basis of the Akaike and Schwarz information criteria, as well as the Jarque-Bera test on normal distribution, and the Breusch-Godfrey test on serial correlation in residuals. The overall model is also tested for possible specification errors using the Ramsey RESET test.

6.3.   Empirical results

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Before running the regressions, all variables were checked for stationarity (Table 1). The majority of variables, excluding the inflation threshold, the inflation standard deviation, and the returns on national deposits, are non-stationary in levels and stationary in first differences. Therefore, all regressions were run with differences. Following Ortiz (1983), Cuddington (1983), Piontkivsky (2003) *inter alia*, dependent variables, as well as real wage arrears, real income, cash holdings and deposits in domestic and foreign currencies are taken as logs. Thus, their first differences are growth rates.

The results of the econometric estimates are presented in Table 2. Four models show the final regressions obtained by means of general to specific testing designed to reduce potential omitted variable problems in the estimations. The exclusion of explanatory variables and their lags was done on the basis of redundant variable testing, controlling for information criteria, standard error of regression, normality of residuals, stability[7], and absence of serial correlations among residuals and specification errors. Initial models include up to three lags. The only exclusion was made for the demand for domestic currency equation that included up to six lags, since omitted variable tests indicated the importance of higher-order lags.

Demand for foreign cash. In line with ex-ante expectations, household demand for foreign currency in Ukraine in the period between 1996 and 2002 negatively and significantly depended on the rate of return of domestic-currency deposits at commercial banks, although no significant relationship between the rate of return on foreign-currency deposits and demand for foreign currency was found. The role of depreciation appeared much less important than anticipated. Although this variable retained the correct sign, it is not statistically significant.

According to estimates, the relationship between real household incomes and demand for foreign currency is negative, i.e. an increase in income reduces the demand for foreign cash. One possible explanation for this is a close association between real household incomes and confidence in the national currency. In this case, the relationship between real income and purchases of foreign currency is indeed negative, because higher incomes mean greater trust in the stability of the national currency, and hence, less demand for foreign currency. The significant negative sign of domestic cash holdings in the foreign currency demand equation means that these two assets (foreign and domestic cash) are substitutes in household portfolios.

Among the institutional variables, the most important appeared to be the transaction costs and macroeconomic stability measured as the standard deviation of inflation. Transaction costs are negatively related to demand for foreign cash, while inflation volatility inspires the use of foreign currency. The latter agrees with the results obtained by Piontkivsky (2003) for transition economies. Thus, one important recommendation for reducing the level of dollarisation is to preserve the stability of inflation, i.e. adopting an inflation targeting policy.

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[7] According to Chow breakpoint test, there is some evidence of the structural break in the foreign cash equation. However, estimated equations for two sub-periods retain variables of basis (Table 2) equation and their signs, while incorrectly specified according to Ramsey test. Therefore, we analyze basic equation, although this analysis should be taken with caution.

Demand for foreign-currency deposits. The importance given to the second component of foreign-currency denominated assets in a portfolio positively significantly depends on its rate of return and on real household income. The demand for foreign-currency deposits is negatively related to cash holdings both in domestic and foreign currency, but positively to bank deposits in domestic currency.

Among the institutional variables, the most important one appeared to be macroeconomic instability matured by volatility of inflation that enters the equation with the negative sign. That corresponds to our prior expectations that macroeconomic instability will encourage holdings in foreign cash, but deter the demand for all other assets including the demand for foreign-currency deposits.

Demand for domestic cash. The most significant variables that explain the demand for domestic cash holdings are real income and holdings of foreign cash. The former is positively related to demand for domestic cash, while the latter is linked negatively. In other words, foreign and domestic cash substitute for each other in household portfolios. The inflation threshold also appeared to play a role in the demand for domestic currency: Households reduce domestic currency holdings when inflation increases beyond the 2 per cent limit.

Demand for domestic-currency deposits. The household demand for national currency deposits depends significantly on the rate of return, and negatively on domestic currency depreciation. Among institutional factors, the most important appeared to be the credibility of the banking system in Ukraine. The negative and significant signs between demand for domestic-currency deposits and holdings of foreign cash indicates that a higher credibility of the banking system allows de-dollarisation though a shift from foreign cash savings at home to domestic-currency savings at banks.

Yet another variable that influenced the demand for domestic-currency deposits is the dummy for the financial crisis that occurred in August 1998. It significantly and negatively affected the demand for national currency deposits.

To summarise, the demand for various financial instruments depends not only on the traditional explanatory variables like the rate of return on assets, but also on institutional variables. Although the significance of different institutional variables varies widely, it is clear that the higher the credibility of the banking system and greater the macroeconomic stability, the greater is the demand for financial assets denominated in domestic currency.

7   Conclusions

The worsening of the living conditions of individuals together with the liberalization of the foreign exchange marked caused a growth of demand for foreign currency in Ukraine soon after the declaration of independence in 1991. Currently Ukraine seems to enter a reverse process with a decrease in the rate of currency substitution in the country, sometimes also called "de-dollarisation". Both holdings of foreign cash and foreign-currency deposits at commercial banks are reducing, and we may expect that this trend will continue, given continuing favourable conditions. These conditions incorporate institutional variables, especially the credibility of the banking system and price stability.

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Greater credibility increases the demand for national currency, substituting for foreign cash holdings. This may be a sign that households perceive stability of banking system as stability of the national currency. Also, higher price stability cause a reduction in demand for foreign cash, suggesting potential attractiveness for inflation targeting policy in Ukraine. We can conclude that the development of Ukraine's financial system and wise monetary policy are crucial for the further reduction of the level of currency substitution in Ukraine, at least at the level of households.

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Table 1

Augmented Dickey-Fuller and Phillips-Perron tests

	Phillips-Perron test			Dickey-Fuller test		
	Level	*First difference*	*Second difference*	*Level*	*First difference*	*Second difference*
L _ SH _ FCASH	*2.33*	*-6.88**	*-17.81**	*2.15*	*-4.02**	*-9.31**
L _ SH _ FDEP	*-2.43*	*-9.76**	*-20.55**	*-1.42*	*-6.70**	*-8.63**
L _ SH _ NDEP	*0.82*	*-8.88**	*-21.12**	*0.77*	*-4.62**	*-8.97**
L _ SH _ NCASH	*-2.12*	*-9.20**	*-22.27**	*-1.82*	*-5.46**	*-9.94**
L _ FCASH	*-3.51**	*-3.33***	*-10.15**	*-2.01*	*-3.07***	*-6.669**
L _ FDEP	*-2.98***	*-7.25**	*-17.09**	*-2.48*	*-4.79**	*-8.36**
L _ NDEP	*0.26*	*-10.13**	*-23.50**	*0.34*	*-3.61**	*7.54**
L _ NCASH	*0.26*	*-10.13**	*-23.50**	*0.10*	*-5.53**	*-10.14**
L _ INCOME	*-2.60***	*-19.02**	*-39.12**	*-0.39*	*-8.77**	*-13.32**
RETURN _ NDEP	*-4.57**	*-11.99**	*-27.60**	*-3.16***	*-6.20**	*-10.49**
RETURN _ FDEP	*-2.23*	*-11.45**	*-25.49**	*-2.31*	*-5.53**	*-7.58**
MOV _ AVER	*-3.33***	*-5.23**	*-7.52**	*-2.97***	*-8.61**	*-12.18**
CREDIBILITY	*-1.32*	*-9.73**	*-18.32*	*-0.90*	*-5.54**	*-7.83**
STABILITY	*-4.52**	*-10.89**	*-21.19**	*-5.28**	*-8.34**	*-9.65**
TRANS _ COSTS	*-4.01**	*-12.34**	*-23.54**	*-2.82****	*-6.83**	*-9.24**
THRESHOLD	*-5.38**	*-12.42**	*-22.75**	*-4.46**	*-8.14**	*-10.33**

Table 2

Results of the ADL estimations

	Foreign cash	Foreign-currency deposits	Domestic cash	Domestic-currency deposits
CONST	-0.0069	0.0546*	--	0.0173*
D_RETURN_FDEP(-1)	--	0.0116*	--	--
D_RETURN_NDEP(-1)	-0.0040*	-0.0078	--	0.0111**
DL_INCOME(-1)	-0.0965**	0.2808**	0.2188*	--
DDL_INCOME	-0.0481**	0.2677*	0.1407*	--
D_CREDIBILITY(-1)	--	--	--	0.2300**
DD_CREDIBILITY(-1)	--	--	--	-0.1538**
D_MOV_AVER(-1)	0.0004	--	--	-0.0015
DD_MOV_AVER	--	--	--	-0.0037**
DD_MOV_AVER(-1)	--	--	--	0.0036*
TRANS_COSTS	-0.0103***	--	--	--
DUM_98	--	--	--	-0.1093*
THRESHOLD	--	--	-0.0077	--
STABILITY(-1)	0.0093**	-0.0256***	--	--
D_SDABILITY(-1)	0.0108**	0.0391*	--	--
DL_FDEP(-1)	--	--	--	--
DL_FCASH(-1)	--	0.1338	-0.3135*	-0.2879***
DDL_FCASH	--	0.6987**	-0.3292*	--
DL_NDEP(-1)	--	0.1502	--	--
DDL_NDEP(-2)	--	0.3513**	--	--
DL_NCASH(-1)	-0.2449**	-0.8835*	--	--
DDL_NCASH	-0.4098*	-1.1485*	--	--
DL_SH_FDEP(-1)	--	-1.0518*	--	--
DDL_SH_FDEP(-1)	--	0.0375	--	--
DL_SH_FCASH(-1)	-0.6431*	--	--	--
DL_SH_NDEP(-1)	--	--	--	-1.2845*
DL_SH_NCASH(-1)	--	--	-1.0675*	--
DDL_SH_NCASH(-2)	--	--	0.1312*	--
DDL_SH_NCASH(-6	--	--	0.0573	--
Adjusted R^2	0.8367	0.7051	0.8616	0.6569
Akaike info criterion	-4.8117	-2.7984	-5.1682	-3.5318
Schwarz info criterion	-4.4865	-2.3002	-4.9229	-3.1771
Jarque-Bera test (p-value)	4.2961 (0.1167)	4.2262 (0.1209)	0.7242 (0.6962)	3.4874 (0.1749)
Breusch-Godfrey test (p-value)	3.1038 (0.2118)	0.3353 (0.8456)	1.4460 (0.4853)	3.7580 (0.1527)
Ramsey test (p-value)	2.1822 (0.1396)	0.0236 (0.8780)	2.5431 (0.1108)	0.1464 (0.7021)
No. of observations	81	74	76	81

Note: * for 1% significance level, ** for 5% significance level, and *** for 10% significance level

Appendix A.

Description of variables

FCASH	Households' holdings of cash foreign currency, in real terms
FDEP	Households' foreign-currency denominated deposits at commercial banks, in real terms
NDEP	Households' domestic-currency denominated deposits at commercial banks, in real terms
NCASH	Monetary aggregate M0, in real terms
SH _ FCASH	Share of households' foreign cash holdings within the total portfolio of their financial assets as defined in this paper
SH _ FDEP	Share of households' foreign currency deposits within the total portfolio of their financial assets as defined in this paper
SH _ NDEP	Share of households' domestic currency deposits within the total portfolio of their financial assets as defined in this paper
SH _ NCASH	Share of households' domestic cash holdings within the total portfolio of their financial assets as defined in this paper
INCOME	Monetary income of households, in real terms
RETURN _ NDEP	Return on domestic-currency denominated deposits at commercial banks, percent per annum
RETURN _ FDEP	Return on foreign-currency denominated deposits at commercial banks, percent per annum
MOV _ AVER	Three-month moving average of the domestic currency depreciation, year-on-year terms
CREDIBILITY	Share of total households' deposits at commercial banks to GDP, percentage
STABILITY	Three-month standard deviation of consumer price inflation
TRANS _ COSTS	Transaction costs associated with foreign cash transactions constructed as a dummy variable
THRESHOLD	Inflation threshold, set at 2% per month inflation, constructed as a dummy variable