FINANCIAL DOLLARIZATION:
A TROJAN HORSE FOR UKRAINE?

Nataliia Versal, Andriy Stavytskyy*

Taras Shevchenko National University of Kyiv, Ukraine

Abstract. *The paper revisits the causes and consequences of financial dollarization in Ukraine during the past decade (monthly data). Dollarization in emerging markets plays a dual role: positive and negative. This study of financial dollarization is in the context of resident household holdings of foreign currency-denominated bank deposits and loans. If exchange rates are stable, deposit dollarization allows the withdrawal of money from the shadow economy, and loan dollarization allows the lending of long-term money, which is not possible with domestic currency due to inflation expectations. At the same time, the instability and lack of supply of foreign currencies in the market result in the collapse of household and bank finances, leading to currency risk, credit risk, and liquidity risk. Therefore, the study uses estimate indicators, the deposit dollarization index (DDI), household foreign currency deposits and loans, loan to deposit ratio (LTD), and inflation to find out the tendencies in the context of a changing domestic currency exchange rate. We present three models to reveal the influence of financial dollarization on banking stability. The first one explains the real value of domestic currency deposits through indicators such as M2 (positive), exchange rate (negative), domestic currency deposits (positive), and panic effects (negative). The second one describes the influence of the exchange rate (negative) and panic effects (negative) on foreign currency deposits. The third one explains the DDI through such the exchange rate, M2, and interest rates. The combined models provide an insight about the time necessary to stabilize the Ukrainian banking system.*

Key words: financial dollarization; financial intermediation; foreign exchange rate; emerging markets; financial fragility; banking stability

1. Introduction

Dollarization, and particularly dollarization of the banking system, is not a new idea; it is not even an idea of the twentieth century. For example, dollarization was observed in many African countries in the 1800s (Shuler, 2005): Egypt (1856–1898), Ghana (1856–1898) Liberia (1880s–1985), Tunisia (1873–1904), etc. This phenomenon – a search for an alternative to weak money such as silver or paper money that did not have a sufficient collateral in silver or gold, or the modern money of the countries – cannot ensure the stability of domestic currencies. Many post-soviet countries faced dollarization in the 1990s–2000s (Zoryan, 2005, Mishchenko, Somik, 2007).

* *Corresponding author:*
Off. 809, Faculty of Economics, Taras Shevchenko National University of Kyiv, Vasylkivska Street 90A, Kyiv, 03022, Ukraine
E-mail: a.stavytskyy@gmail.com

Ukraine faced this phenomenon in the early 1990s when its currency depreciated dramatically by 10.256% in 1993. As a result, the US dollar as an alternative currency began to perform unofficially all functions of money: a medium of exchange, the measurement of value, the standard of deferred payments, and the store of value. The situation changed qualitatively after the currency reform in 1996: the Ukrainian hryvnia stabilized, and the level of confidence in the national currency significantly increased; however, the US dollar and the euro starting from 2001 continued to perform two very important functions: as a standard of deferred payments and a store of value, especially for households. Households could illegally buy and sell in dollars and euros as well as legally borrow and lend in dollars and euros. Foreign exchange rates were not as low as in 1996, but after the crisis of 1998–1999, when the domestic currency lost 80% in 1998 and 57% in 1999, the hryvnia gradually revaluated against the US dollar and devaluated against the euro, and foreign exchange rates did not change dramatically before two last crises in 2008 and in 2014. Ukraine's economy faced a significant decline in exports because of the hostilities, severe panic of households in the banking market and the market of foreign exchange, massive withdrawal of capital abroad and the introduction in such conditions of a free exchange rate. Therefore, the devaluation of domestic currency made more than 250% (App. A, Figure A1).

As a result, the country returned to the financial dollarization[1] in the mid-2000s: banks were ready to borrow money in foreign currencies from international financial markets and from residents since these types of resources were cheap and long in comparison with the resources in domestic currencies. At the same time, banks lent these resources either in foreign currencies (US dollar, euro, Swiss franc, etc.) due to foreign currency risks, or in the domestic currency because of high returns. Economic agents were ready to borrow[2] in foreign currencies due to low interest rates and lend money to banks because of the high level of confidence in the dollar and the euro. Overall, financial dollarization worked quite well from 2005 to the autumn of 2008, but after that a disaster struck.

Research in the field of dollarization can be divided into several major tracks. The first one includes research on the causes and types of dollarization in general (Eichengreen, 2002, Alvarez-Plata, García-Herrero, 2007). The second one introduces the link between dollarization and financial fragility (Eichengreen, Hausmann, 1999; Burnside, Eichengreen, Rebelo, 2001; Gulde, Hoelscher, Ize, Marston, De Nicoló, 2004;

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[1] Financial dollarization is a very capacious concept. It can be applied in a broad sense, as defined by Basso, Calvo-Gonzalez, Jurgilas (2007): "The holding by residents of a share of their assets and/or liabilities denominated in foreign currency". Or by Levy-Yeyati (2006): "The holding by residents of foreign currency-denominated assets and liabilities, including bank deposits and loans as well as non-bank assets such as commercial paper or sovereign debt". However, financial dollarization can also be defined in a narrow sense as the holding by residents of foreign currency-denominated bank deposits and loans. The latter concept forms the basis of this study. This approach stems from the fact that these data are open and have been confirmed officially.

[2] Borrowing was possible even when economic agents had no income in a foreign currency.

Alvarez-Plata, García-Herrero, 2007). The third one explains the features of financial dollarization or dollarization in the banking system (Ize, Levy Yeyati, 1998; De Nicoló, Honohan, Ize, 2003; Honohan, Shi, 2003; Levy Yeyati, 2006; Basso, Calvo-Gonzalez, Jurgilas, 2007). The fourth one provides an explanation of the main characteristics of dollarization in Ukraine and its consequences for the banking sector (Bazylevych, 2009; Mishchenko, Somik, 2007; Vasylchenko, Tereshenko, 2013; Versal, 2012).

This paper contributes to the research on financial dollarization in several ways. It attempts to explain the causes and consequences of financial dollarization in Ukraine, based on data on household deposits and loans in foreign currencies during the past decade: (2005–2014). This period has been chosen for two reasons: 1) the existence of detailed statistic of household deposits & loans in foreign currencies (it was not detailed before 2005); 2) the covering of the pre-crisis (2005 – September 2008), crisis (October 2008–2009), post-crisis (2010–2013) and new-crisis (2014) periods. We focus on the DDI (deposit dollarization index) as well as FCD and FCL (foreign currency deposits and foreign currency loans), and their equivalents in the domestic currency to explain their dramatic role both for banks and households. This explains the difference in the behaviour of FCD and domestic currency deposits (DCD) due to a sharp devaluation of the domestic currency and the role of government in the face of such a high level of dollarization.

The paper is organized in four sections including Introduction. Section 2 focuses on the data and methodology of the research. Section 3 explains the implications of financial dollarization on the banking system in Ukraine and presents the regression results based on data of the National Bank of Ukraine (NBU) and domestic banks. In Section 4, we draw conclusions and suggest possible solutions to break the current deadlock.

2. Methodology and data

Since we consider emerging markets, it is important to remember that financial dollarization is only one part of the dollarization of the economy. Due to mistrust, households hold a considerable amount of foreign currency in cash, and this type of dollarization can be measured only indirectly. The basis for such measurement could be, for example, the gaps between household earnings and expenses versus household deposits (or FCD, or deposits in hryvnia (DCD)) or between personal remittances from abroad and FCD.

The causes of deposit dollarization in Ukraine should be analysed in three different periods: 2005–2008 – the period of economic growth, 2009–2013 – the period of crisis and recovery, and 2014 – the period of political crisis, economic crisis, loss of territories, and war. In each of these periods, various dominant factors determine the level of dollarization.

The systematization of the main causes of dollarization presented in the study by Honohan and Shi (2003) and Alvarez-Plata, García-Herrero (2007) allows us to determine whether such factors took place in Ukraine and whether they were significant, as well as to identify other factors that increased the degree of deposit dollarization.

Hysteresis or ratchet effect

The galloping inflation and slow recovery after the collapse of the Soviet Union, long and inefficient economic reforms, and the low standard of living during the first decade of the independence of Ukraine led to the fact that even after a relative stabilization of the situation the economic agents continued to hold foreign currencies as an alternative asset. That is why any shock in political or economic life has always led to an increase in demand for foreign currency, especially from households.

We pay attention to the fact that the calculation of the DDI can be accomplished in several ways. It can be calculated using all the foreign currency deposits of households (HFCD) and firms (FFCD). This approach is used very often in the literature. However, from our point of view, it is more correct when the DDI is based only on HFCD. It should be understood that some of the companies in any country, especially now in the context of globalization, are engaged in import and export activities, which means that exporters and importers hold accounts in 'hard' foreign currencies. Our task is to make a distinction between the two situations. First, the use of hard foreign currency by residents for carrying out foreign economic activity, which is considered a normal practice. Second, the use of a 'hard' foreign currency by residents who are not involved in foreign trade activities, which is a sign that the domestic currency is unstable, i.e. cannot fully serve as a store of value. This means that we can actually use only HFCD for measuring the DDI. Households are not involved in foreign economic activities and, according to the law, cannot receive wage in a foreign currency. Hence, if the volume of HFCD in comparison with household deposits in domestic currencies grows, it indicates an increase in distrust in the national currency and the search for alternative opportunities for savings. Thus, HFCD is a valid indicator of the real level of dollarization in Ukraine. It becomes evident when we look at the DDI, which is based on HFCD/M2, FFCD/M2 (DDI-based firms), and the aggregate DDI ((HFCD+FFCD)/M2) (Fig. 1).

In fact, we observe a situation where during the entire period FFCD/M2 is within 5% to 10% with the volatility about 86.82%. At the same time, HFCD/M2 is most susceptible to fluctuations, the volatility of which is 271.69%, and this index determines the aggregate DDI. The calculation of the correlation gives us the same result, namely, the correlation between HFCD/M2 and the aggregate DDI is 94.82%, between FFCD/M2 and the aggregate DDI is 10.97%, and between HFCD/M2 and FFCD/M2 is minus 21.17%. The negative correlation could be explained by different purposes and behaviours of households and firms. Households place foreign currency on deposit

accounts in order to get profit in a long-term. Therefore, in periods of economic stability, they increase the amount of deposits in foreign currencies. If the situation changes, households try to quickly withdraw deposits. Firms place foreign currencies on accounts only for carrying out their activities, as a rule, export–import operations. So, the amount of foreign currencies on corporate accounts depends on the situation in national economy and on international markets. We have to emphasize that households can use cash for settlements, whereas firms cannot. That is the reason why, even in times of crisis, firms are obliged to keep their money in banks.
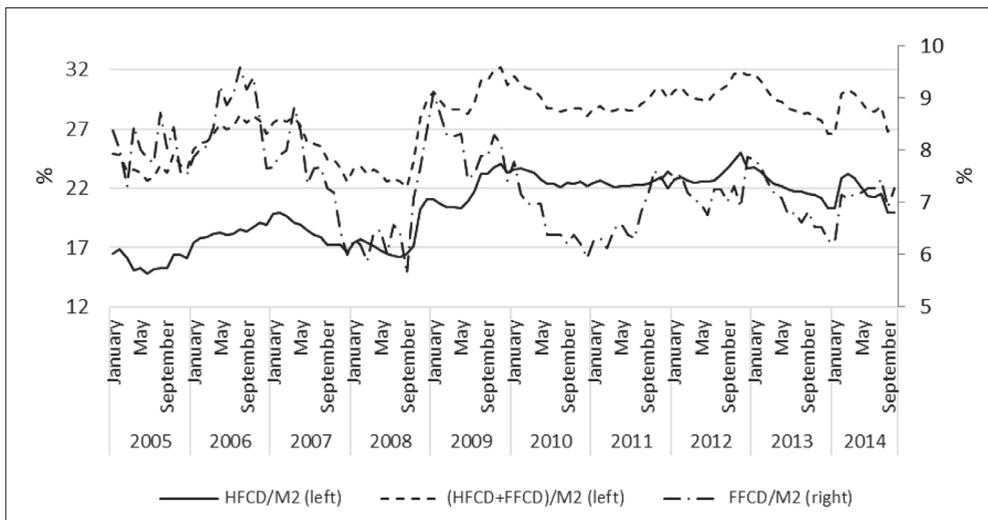
FIG. 1. **Trends of the DDI in Ukraine during January 2005 – October 2014, percent**

We want to emphasize that the money function of a foreign currency to be a store of value is not always accompanied by an increase in FCD in Ukraine. After the collapse of the Soviet Union, depositors lost money that had been stored in state-owned banks, and their confidence in the banking system is very fragile. Any unforeseen circumstances lead to a bank run even though banks attempt to actively engage households. Despite the fact that the Deposit Guarantee Fund is effective in Ukraine, there are special rules with regard to deposits in a foreign currency: the return of the foreign currency deposit is possible only in the local currency, and it is converted at the official foreign exchange rate at the time of the commencement of the bank's removal from the market and implementation of the temporal administration in the bank. If the exchange rate is stable, there is no problem, because the official rate and market rate are virtually at the same level. Under devaluation, especially sharp devaluation, the situation changes dramatically. Currently, the procedure of temporal administration lasts for about three months (previously it could take up to one year), during which contributions cannot be returned yet and the national

currency continues to depreciate. Thus, losses of depositors can be very significant. In Ukraine, the ratchet effect in the context of financial dollarization has a double meaning: households keep their money in foreign currencies because they do not trust the national currency, but they also prefer to keep savings in foreign currencies outside banks, as the level of confidence in the banking system is very low (Fig. 2).
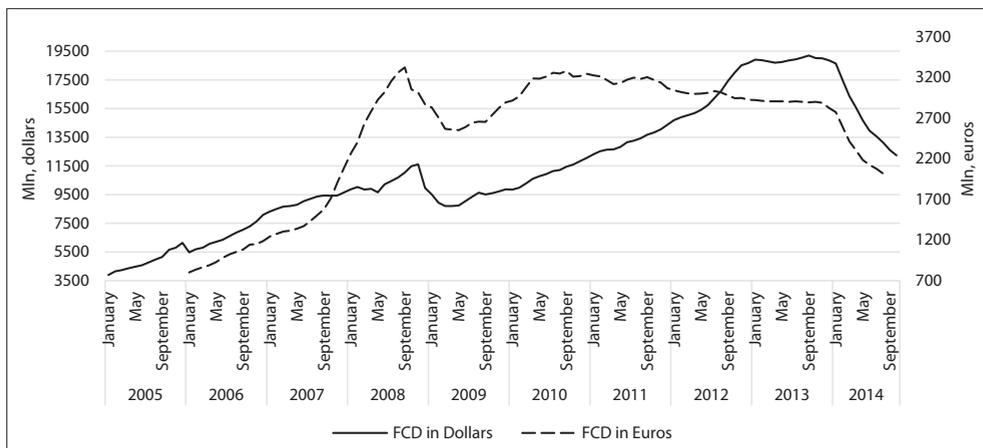
FIG. 2. **Trends of HFCD in dollars and euros in Ukraine during January 2005 – October 2014, mln.**

Figure 2 shows the characteristics of deposit dollarization in Ukraine. Basically, until October 2008 – the beginning of the crisis in Ukraine – volumes of deposits were growing both in euros and dollars. Interestingly, the preference was given to deposits is euros. Therefore, from October 2007 to October 2008, the growth of deposits in dollars amounted to 21.79% and in euros to 78.51%. Of course, this raises a logical question of why deposits in foreign currencies grow in favourable economic conditions. The answer is simple: households are not yet ready to completely abandon the foreign currency (ratchet effect), but they are ready to entrust their savings in foreign currencies to commercial banks. Banks are also on the rise; they need resources, and interest rates are quite attractive: 6-month deposit rates could reach 7% in euros and 10% in dollars. Such a phenomenon cannot be regarded solely as the growth of dollarization, especially in comparison with a basket of currencies (i.e. a shift from dollars to euros). Rather, it is the search for a new compromise and willingness to hold deposits in various currencies, including the domestic currency, to maximize profit and minimize risk. The same situation was observed in 2010–2013, but its distinguishing feature was that households shifted from deposits in euros (due to the instability in the EU) to deposits in dollars.

In the crisis period of October 2008–2009, the volume of FCD decreased; however, in comparison to pre-crisis and post-crisis volumes, it can be observed that it was only the outflow of deposits, not a decrease in the level of dollarization. Moreover, data comparing October 2008 with October 2009 show that the rate of decline in deposits

in dollars amounted to 16.30% compared with 10.20% for the euro and 17.23% for the hryvnia. In other words, households took away the foreign currency deposits from banks faster than domestic currency deposits due to peculiar guarantees in the return of foreign currency deposits: they would have to be converted in the domestic currency.

The same situation repeated in 2014 when Ukraine faced the biggest threat to its economic independence. Deposit dollarization declined sharply, while cash dollarization increased significantly due to the withdrawal of foreign currency deposits and the purchase – at any price – of foreign currencies by households in such extremely precarious conditions. The National Bank of Ukraine (NBU) had to impose restrictions on the purchase of foreign currency in order to slow down the sharp devaluation of domestic currency. Households could buy foreign currency amounting to the equivalent of no more than 3000 hryvnia (about 120 euro) per day. However, under conditions of excessive demand and the lack of foreign currency in the country, this led to a revival of the black market. So, at this point we can reach a conclusion that deposit dollarization is not so bad from the point of view of the economy (App. C, Fig. C1) as the money from the shadow economy falls into the banking system and starts working for the whole society. However, such a conclusion is possible only at this stage; before, we have considered the direction of placement of such deposits by banks.

Reliability versus risk

Households in Ukraine, in conditions that are constantly changing, have to choose between two options: high-yield deposits in hryvnia or low-yield FCD. In the context of a fixed exchange rate, the choice was not so complicated: households gave preference to deposits in the domestic currency. The yield on such deposits was 1.5 to 2.5 times higher than the yield on deposits in a foreign currency.

The situation changes drastically under introduction of a flexible exchange rate system in 2014 – since the risk of devaluation substantially increases and the yield on deposits in the foreign currency increases, too. Devaluation occurred twice during the analysed period in Ukraine and led to the situation when the yield of deposits in foreign currencies significantly exceeded the yield in the local currency as a result of the 2008–2009 crisis devaluation of the hryvnia by about 60% (100% in 2014). Therefore, dollarization can be regarded as a protection against the risk of devaluation, even if money is not kept in deposit accounts.

International labour migration

Due to the lowering personal income and increased unemployment, Ukrainians often seek jobs in Western Europe or Russia. This provides additional foreign exchange earnings to households, which later could be transformed into FCD (Table 1).

The shadow economy and corruption

The shadow economy is a significant part of the economy of Ukraine, and this promotes the growth in demand for 'hard' currency (Table 1). Corruption spurs this demand, as in most cases payments are made in foreign currencies. The lack of control in the field of household income and expenditure contributes to the fact that the volumes of household deposits in banks are significantly bigger than the volumes of household savings (income minus expenses).

TABLE 1. **Household deposits and savings, gaps**

Year	FCD in USD dollar, mln. dollars	FCD in EUR, mln. euros	DCD, mln. hryvnias	Household savings, mln. hryvnias	Personal remittances, received, mln. dollars	GAP between household savings and DCD, mln. hryvnias	GAP between personal remittances and FCD in USD, mln. dollars
2005	5 020	–	32 882	45 651	2 408	12 770	−2 612
2006	6 782	995	51 345	44 203	3 102	−7 142	−3 680
2007	8 999	1 669	81 594	39 015	5 290	−42 579	−3 709
2008	9 911	2 566	107 003	69 772	6 782	−37 231	−3 129
2009	9 686	2 863	103 936	82 466	5 941	−21 470	−3 745
2010	10 964	3 083	122 340	156 358	6 535	34 018	−4 429
2011	13 340	3 150	152 909	123 123	7 822	−29 786	−5 518
2012	16 684	2 985	175 714	147 280	8 449	−28 434	−8 235
2013	18 881	2 874	225 232	132 570	9 667	−92 662	−9 214

Source: authors' calculation based on data from the NBU and World Bank.

Table 1 shows that households have much more money than they officially earn and receive remittances from relatives abroad. This confirms the presence of illegal earnings and the shadow economy, respectively. In 2013 the shadow economy in the sector of households worked more with the domestic currency (growth in 2012–2013 amounted to 226%) compared with only 12% with the dollar.

The causes of loan dollarization are somewhat different from deposit dollarization. These reasons should be considered from the viewpoint of banks and households. Actually, these causes are the benefits of dollarization. Banks are motivated to use foreign currencies in lending to protect against inflation, high profitability, and the minimization of currency risks due to access to international capital markets. The most significant motive for households is the low cost of FCL compared to the cost in local currency. Let us consider the motives of banks, who are the initiators of lending in foreign currencies, in more detail.

Protection against inflation

One of the major reasons that forces banks to lend in a foreign currency is a hedge against inflation. This is especially true when it comes to long-term lending, especially

when we talk about mortgage lending. Demand for real estate in Ukraine for a long time was limited due to the lack of purchasing power of households, which was explained by the very high risk and therefore high interest rates. The way out of this situation was lending in foreign currencies, and from the beginning this was done in two currencies: the US dollar and the Swiss franc. This resulted in a boom in the mortgage market and the real estate market in 2007–2008. Mortgage lending, when the volumes of real estate were insufficient, spurred housing demand and led to an unprecedented rise in house prices, which had an important consequence for banks – an increase in interest income.

The yield on mortgage loans also led to a redistribution of the dollar loans market: a shift from consumer loans to mortgage loans. It must be emphasized that mortgage lending produces long-term profitability. Moreover, as the life of consumer loans is short, consumer lending can be realized in domestic currency without significant risks, favouring mortgage lending in foreign currencies and increasing consumer loans in domestic currency, which the 2008–2009 crisis stopped. In addition, lending in the foreign currency was declining until 2009 when the NBU forbade lending to households in a foreign currency. As a result of this prohibition, mortgage lending has virtually stopped.

High profitability

Profitability of foreign currency lending is very high in Ukraine. Of course, interest rates are lower than on loans in the domestic currency, but, firstly, this is always offset by higher commission income, which has never been regulated – very often, the borrower did not even know about their amount due to financial illiteracy. After a while, the regulator ordered banks to disclose the real interest rate, which could exceed the rate several times. Secondly, in the case of mortgage loans, long-term loans allow banks to earn up to 150–200% for the entire loan term.

Minimizing currency risks

In the analysed period, banks started to enter international capital markets where the borrowing was often in dollars. To minimize risks, it was important to lend money inside the country in dollars, too.

Turning to the issue of cost, it should be noted, once again, that in conditions of stable foreign exchange rates, loans in a foreign currency are completely controlled by both the lender and the borrower. At a time of booming FCL, the economic situation in Ukraine was stable, and there was growth in household welfare. On the eve of the crisis, there was even a revaluation of the currency. However, in the situation of domestic currency devaluation, the situation changes dramatically.

When the national currency devaluation is not high, banks receive an additional income. However, at the same time, we should not forget that households do not have income in hard currency, which means they will need to convert the domestic currency

into a hard currency. Also important is the point that household income remains unchanged. In these circumstances, the debt burden for households increases, although not critically.

If we add the domestic currency devaluation crisis, which is invariably associated with job cuts and wage cuts, we get a situation where households are increasingly faced with the problem of debt servicing. In these circumstances, banks are already beginning to feel the credit risk. The way out of this situation is the restructuring of loans. This is an additional source of income for banks (increase in terms equals to an increase of income), but at the same time it provides a long-term income. Further, banks must pay depositors and creditors today. Thus, we have a chain: currency risk – credit risk – liquidity risk.

The situation is aggravated even further when the offer of hard currency decreases sharply in the market. In this case, demand for the foreign currency on the part of households will be affected due to, firstly, FCL to borrowers who do not have income in the foreign currency, and secondly, households who hold savings in the national currency. In the face of uncertain inflation expectations, households will seek to protect their savings, converting them into a foreign currency.

All this will inevitably push the foreign exchange rate higher and higher. As a result, debt on FCL in UAH equivalent grows, so that the credit risk will be so obvious (Fig. 3) that restructuring cannot be a solution in this situation. This was most clearly seen in Ukraine in 2014 when, instead of reducing debt on FCL, unprecedented growth occurred.
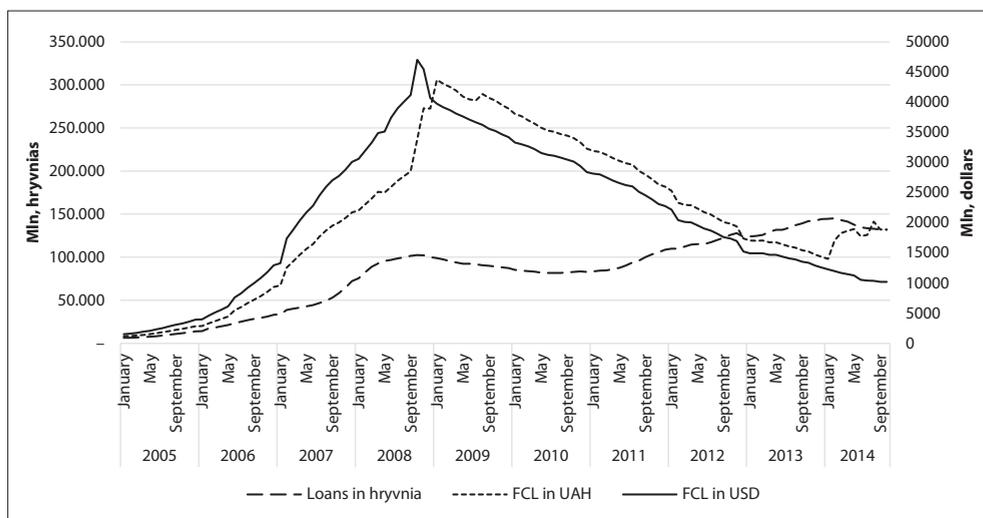
FIG. 3. **Trend of domestic currency loans, foreign currency loans in dollars and its equivalent domestic currency for households in Ukraine during January 2005 – October 2014, mln.**

Source: authors' calculations based on data from the NBU

The debt burden increase also led to a massive failure to repay loans and, as a result of household pressure, the NBU decided to transfer FCL in the domestic currency at the exchange rate of 7.99, which was in force at the beginning of 2014, instead of the real exchange rate.

At the end of this section, it is logical to see the relation between FCL and FCD. LTD in euros is quite good, but LTD in dollars is extremely high (Fig. 4). Of course, we can find an explanation for this: the funding of dollar-denominated loans to households is carried out through not only the FCD of households, but also the entry of banks into international capital markets. At the same time, the danger is twofold. First, Ukrainian banks failed to obtain long-term funding on international capital markets. As a consequence, many of them experience problems with returning borrowed money to foreign partners due to the global financial crisis. Also of note is the second peculiarity, namely the placement of these funds by banks in the long-term, as a rule, mortgage loans to households who do not have income in a foreign currency.
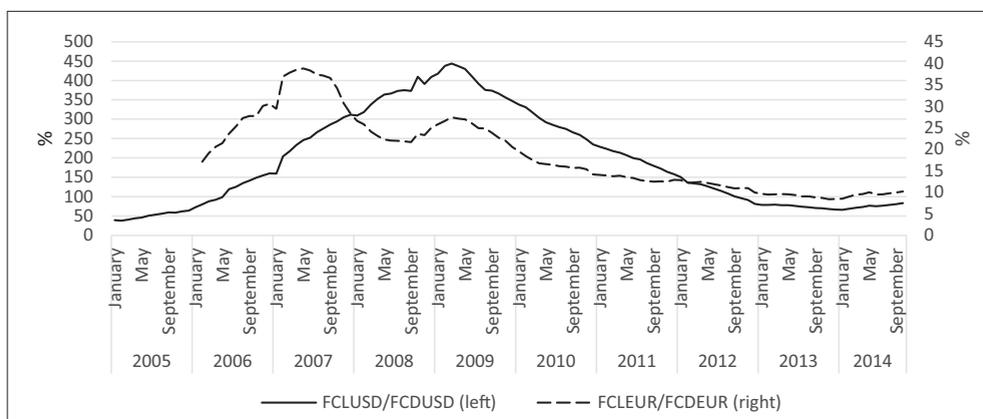
FIG. 4. **Trend of household LTD in dollars and LTD in euros in Ukraine during January 2005–October 2014, %**
Source: authors' calculations based on data from the NBU.

We also want to note that it is impossible to say with confidence that FCD growth promotes FCL growth in Ukraine. This is evident from Fig. 5 as well as from the calculation of the correlation between the month-over-month percentage increase of these indicators, which is 42.82%. Of course, at some point, FCD plays a role, but only as long as banks do not receive funding from the international financial market.

3. Implications of dollarization on the banking system in Ukraine

For the purposes of this study we collected monthly data from January 2005 to October 2014 using official sources of the NBU. We considered the change in local currency deposits, foreign currency deposits, and level of dollarization. The main task of our

approach is to discover the financial reasons for this impact, omitting the macroeconomic factors. Therefore, we choose the following variables for the modelling: *DDI* – the deposit dollarization index (HFCD/M2), *DEP_UAH* – the amount of deposits in the local currency, mln., UAH, *DEP_USD* – the amount of deposits in the foreign currency, mln., USD, *ERATE* – the exchange rate, UAH per 1 USD, *INFL* – CPI, *M2* – monetary base M2, mln., UAH, *PUAH* – the rate for deposits in the local currency, *PUSD* – the rate for deposits in the foreign currency, and *TOTAL_INFL* – the inflation index, for calculating the change in CPI from December 2004. This shows how much prices grew from the base period. The descriptive statistics of the mentioned above variables is presented in App. B, Table B1.

The task of the analysis is to provide econometric models that could help to explain the relationship among different macroeconomic variables and the amount of deposits in US dollars and UA hryvnias. The accurate approach to build an econometric model requires using stationary data to avoid false relations. Therefore, the first step of the analysis is to test all variables for stationarity. The following table (App. B, Table B2) contains results of Augmented Dickey–Fuller test probabilities. The results suggest that all variables (except INFL) are integrated of the first order, while INFL is stationary in levels. It means that we need to use all variables (except, maybe, INFL) in first differences. The result is not surprising, taking into account the high level of inflation in Ukraine: almost all nominal macroeconomic variables have a definite trend.

Bank runs: DCD versus FCD

The study period allows us to select three cases, which can be identified as bank runs (Table 2).

TABLE 2. **Bank runs in Ukraine**

	Start date		Duration, months		Return to pre-crisis level		Reserve ratio on start date, %		Reserve ratio during bank run, %	
	FCD	DCD	FCD	DCD	FCD	DCD	FCD	DCD	FCD	DCD
2004*	December 2004	November 2004	1	2	January 2005	March 2005	7.50	7.50	6.5	6.5
2008–2009**	December 2008	October 2008	4	6	October 2009	July 2009	4.50	0.75	4.005 0.50	0.00
2014***	October 2013	January 2014	12	9	–	–	10.00	0.00	10.67 4.75	0.00 4.75

Source: authors' calculation based on data from the NBU.

* Orange Revolution (political crisis), devaluation of the domestic currency – 0.0%.

** Financial crisis as a reflection of the global financial crisis, devaluation of the domestic currency – 58.2%.

*** Euromaidan Revolution (political crisis), the Crimea annexation and the war in East Ukraine, devaluation of domestic currency – 97.2%.

In all these cases, the NBU acted very quickly and almost identically. First, it used administrative methods: limiting the money through ATMs, increasing compensation on deposits, freezing bank loans at the pre-crisis level, limiting the return on fixed-term deposits, and lowering reserve requirements. From our point of view, the latter method was quite effective and therefore caused a certain surprising change of tactics by the NBU in the last crisis. It should be noted that the initiators of reducing reserve requirements in 2014 were banks rather than the NBU. In addition, we have to emphasize that a negative factor for FCD is the fact that banks often proposed to return FCD to households in UAH according to the exchange rate of the NBU, and not at the market rate.

The first hypothesis is formulated in the following way: what factors are significant for explaining the real value of DCD. The fact is that Ukrainian hryvnia has a rather strong inflation influence; therefore, many households try to protect their savings by taking into account their inflation expectations. For this reason, we chose nominal values of DCD normalized on the inflation index as a dependent variable. This value shows the real purchase parity in 2004 prices.

We obtained a very interesting set of independent indicators, which helps explain the change in deposits. Firstly, one should mention the real increase in the M2 parameter. Households estimate the increase in the monetary base and normalize it to the inflation index to get their draft approximations about possible increases in deposits. If the monetary base increases faster than prices, then households should have more deposits; therefore, we estimate a positive correlation with deposits. The second factor is the currency exchange rate normalized to the inflation index. Since 1996, the currency exchange rate in Ukraine had been fixed, significantly devaluating during the financial crises in 1998, 2008, and 2014. At the same time, many people evaluate the economic stability of a country using the exchange rate. In June 2014, the policy of the NBU changed, proposing a flexible exchange rate. This led to a dramatic devaluation of the Ukrainian currency. Therefore, one may admit a strong panic in the currency market. By analysing household behaviour, we should expect a significant negative effect of the exchange rate variable, because during any currency crisis one usually takes all hryvnia deposits and converts them into US dollars. Taking into account this thinking, we should include the model dummy variable SUPERPANIC. This variable describes the currency crisis of 2014, taking the value 1 in February (when the Revolution started) and July (when the new Head of the NBU changed the policy concerning the exchange rate) and 0 in all other months. We expect that such a panic should decrease the amount of deposits, so the coefficient for this variable should be negative.

Finally, we should consider the financial inertia of deposits. This means that households cannot take back deposits at once, so the amount of deposits is usually highly correlated with this quantity in the previous period. We expect a positive relation because most deposits can be returned only in 2–3 months (common time of all deposits is 3 months in Ukraine).

We estimated the following model, which explains the change of real-valued deposits based on 115 observations from January 2005 to October 2014 (Eq. 4). In this model, the variables *DEP_UAH, M2* are measured in UAH mln, *ERATE* – in UAH per 1 USD, *SUPERPANIC* takes only two values – 0 and 1, *TOTAL_UNFL* is an index having the minimum value 1.

$$\Delta \frac{DEP\_UAH_t}{TOTAL\_INFL_t} = \beta_0 + \beta_1 \Delta \frac{M2_t}{TOTAL\_INFL_t} + \beta_2 \Delta \frac{ERATE_t}{TOTAL\_INFL_t}$$
$$+ \beta_3 \Delta \frac{DEP\_UAH_{t-1}}{TOTAL\_INFL_{t-1}} + \beta_4 SUPERPANIC_t + \varepsilon_t \tag{4}$$

Some data were omitted because of using lags of the variables. The final estimation is presented in Table 3, Fig. 5.

TABLE 3. **Final estimation of the model (Eq. 4)**

Coefficient	Coefficient value	Std. error	t-Statistic	Prob.
β_0	37.26361	146.6321	0.254130	0.7999
β_1*	0.160395	0.025336	6.330656	0.0000
β_2*	−6046.266	1301.414	−4.645921	0.0000
β_3*	0.294561	0.078035	3.774708	0.0003
β_4*	−3410.268	1213.038	−2.811345	0.0058

R-squared	0.615248	Durbin–Watson stat	2.059378
F-statistics	44.37431	Prob(F-statistics)	0.000000

Notes. The asymptotic t -statistics in parentheses have a standard normal distribution. The t-statistics in square brackets are based on standard error estimates (OLS estimates).

* Statistical significance at the 1% level.
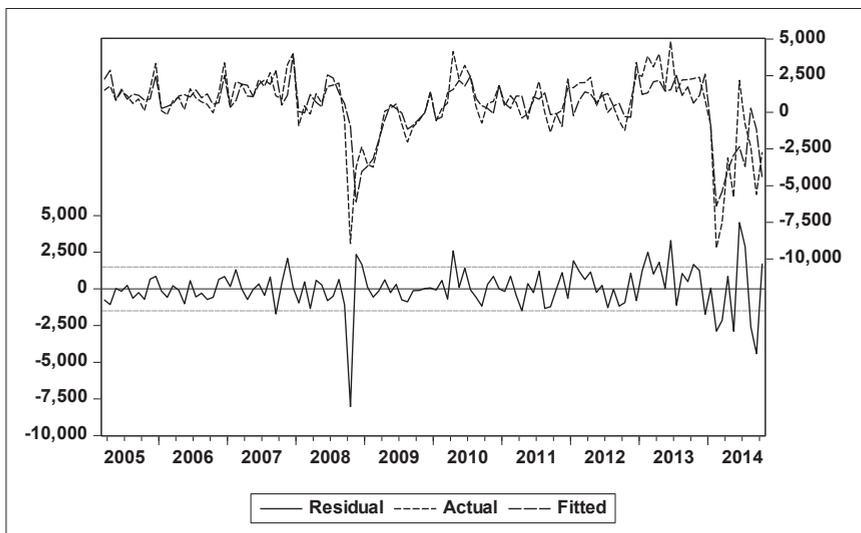
FIG. 5. **Graphical illustration of the model (Eq. 4)**

This model is significant (Prob(F-Statistic) < 0.05), all factor coefficients (except the intercept) are also significant (prob<0.05), the model does not have either heteroscedasticity (White test: F-statistic = 0.81, Prob(F) = 0.63 > 0.05) or the autocorrelation of residuals (LM test with 2 lags: F-Statistic=1.57, Prob(F) = 0.21 > 0.05). The signs of the coefficients match our assumptions.

According to the model, the devaluation of the local currency led to a dramatic deposit outflow from banks. Each one real UAH increase (in terms of purchasing parity 2004) in the exchange rate led to 6 bln. UAH decrease in deposits (coefficient β_2). According to the official data of the NBU, our currency devaluated from approximately 8 UAH at the beginning of 2014 to almost 13 UAH by the end of October, 2014. The inflation index changed from 2.26 in January to 2.69 in November (2014), meaning that currency devaluation (coefficient β_2, normalized on inflation change) is responsible for the outflow of approx. 7.8 bln. real UAH or 24%[3] of all withdrawals (deposits decreased in 2014 by about 32 bln. UAH)[4].

The second negative factor was the panic effect, which can be measured as 3.4 bln. real UAH per month (coefficient β_4), yielding about 21% for 2 months of active panic. At the same time, the general negative effect was because of the restriction of the monetary base. The increase of 1 bln. real M2 gives 0.16 bln. UAH in real deposits. As the monetary base M2 increased for 10 months for 66 bln. nominal UAH (according to NBU data) but decreased in real value, it gave approx. –7.2 bln. real UAH of new deposits, or 22.2%.

Finally, the inertia in deposits has a controversial effect of 0.29 bln. real UAH (coefficient β_3) for each 1 bln. real UAH obtained in the previous period. In most cases, we observed a decrease in real deposits in 2014, but some periods were positive for the banking system. Taking into account the previous decrease in real deposits, we estimate the influence of this parameter as –10.6 bln. real UAH, or 32.8%.

Summarizing, one may come to the following conclusions:

- The further devaluation process will have a negative effect on the amount of deposits. At the end of 2014, the official exchange rate was about 16 UAH per USD, but the black market proposed an exchange rate of 19 UAH per USD. If the NBU expected the revaluation of the local currency to 16 UAH/USD, it could have had a huge positive effect on deposits, because it could return deposits to the amount of about 18 bln. of real UAH or approx. 45 bln. of nominal UAH. Unfortunately, the NBU chose the further devaluation of the national currency, it decreased the amount of deposits significantly.

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[3] The percentage was calculated as the estimated change from the particular factor in the model divided by the total decrease of deposits from all factors in the model.

[4] The change was calculated in the following way: (13/2.69–8/2.26)*6046 = 7 816 mln. UAH. The further calculations were made in the similar manner.

- The panic effect has passed, which means that this negative effect will not influence the amount of deposits further. It is quite probable that after some months the boomerang effect will bring money back to banks.
- According to the model, households make decisions about their deposits based on data or their expectations of currency exchange and inflation in current and previous months. In addition, they take into consideration the increases in such variables. This means that the full effect can be observed in 3 months (1 quarter lag). In other words, if the situation in the country is stable, a huge increase in deposits should be expected in the same quarter. A small increase in deposits may be observed in the following month if the exchange rate is stable.
- Households use hryvnia deposits to save money. If the monetary base increases, they try to enlarge their deposits. At the same time, the expectations of inflation slow the increase in deposits because of buying more foreign currency. In this way, the policy of the NBU, concerning targeting inflation, seems to be quite reasonable.

The next important issue is the role of FCD in the banking system. We attempt to determine the most important factors and the influence of deposit rates on their amount. It is very important to understand that Ukrainian households use FCD to guarantee their savings independently of inflation or devaluation processes. Most of the population tries to buy foreign currency at the first opportunity. This situation becomes much more complicated in the periods of crisis. At the same time, many households do not trust the national banking system; therefore, they prefer to keep money at home. In case of panic on the currency market, they prefer to take back all their deposits from banks. One should realize that even higher deposit rates could not stop the outflow of deposits in such an emergency.

We calculate all currency deposits in US dollars. In fact, Ukrainian banks propose FCD in US dollars, euros, Swiss francs, Russian roubles, and, quite rarely, Great Britain pounds. All other currencies are not very popular in the country. We recalculated all kinds of currency deposits in USD according to the official NBU exchange rate for all time periods.

The exchange rate remains the most important indicator of financial stability. We analyse how important this parameter is for its trends. We consider the model which can estimate the speed of the population's decisions about deposits. The model includes the exchange rate in different time periods to show the reaction of households to any changes.

Usually, the amount of deposits should correlate with the deposit rate. In Ukraine, this differs in some way because the main goal of households having FCD is not to make a profit but to secure their savings. All models show the low significance of the deposit rate; therefore, we omitted it in the final estimation.

We also added a dummy variable to show the great outflow of currency deposits in 2014 (SUPERPANIC). We expect that any instability in the market due to economic and political reasons should decrease the amount of deposits.

Our model looks like this (Eq. 5):

$$\Delta DEP\_USD_t = \beta_0 + \beta_1 \Delta ERATE_t + \beta_2 \Delta ERATE_{t-1} + \beta_3 \Delta ERATE_{t-2}$$
$$+ \beta_4 \Delta ERATE_{t-3} + \beta_5 SUPERPANIC_t + \varepsilon_t \tag{5}$$

The increase of deposits is measured in bln. UAH, ERATE – in UAH per USD. The estimation of the model gives the results in Table 5, Fig. 6. We used the current period and 3 lags of exchange rate variable as the most popular deposits term is exactly 1 quarter. The longer lags won't increase the significance of our model and do not provide the economic rationale.

TABLE 4. **Final estimation of the model (Eq. 5)**

Coefficient	Coefficient value	Std. error	t-Statistics	Prob.
β_0*	218.3346	22.92649	9.523244	0.0000
β_1*	−541.8707	83.45579	−6.492907	0.0000
β_2*	−552.6578	77.45273	−7.135421	0.0000
β_3*	−357.6839	83.40770	−4.288380	0.0000
β_4*	−321.1622	89.33431	−3.595060	0.0005
β_5	−416.9309	189.0799	−2.205052	0.0296

R-squared	0.733548	Durbin–Watson stat.	1.645832
F-statistics	59.46527	Prob(F-statistics)	0.000000

Notes. The asymptotic t-statistics in parentheses have a standard normal distribution. The t-statistics in square brackets are based on standard error estimates (OLS estimates).

* Statistical significance at the 1% level.

The model is adequate (Prob(F-Statistic) < 0.05) as all the coefficients are significant at the 95% and 99% (except β_5, which is significant with 95% level) levels and the residuals are homoscedastic (White test: F-statistic = 0.81, Prob(F) = 0.63) and not correlated (LM test with 2 lags: F-statistic = 1.57, Prob(F) = 0.21).

The results support our assumptions. The increase in the exchange rate has a dramatic negative effect on the amount of deposits. This influence can be seen to extend longer than the whole quarter after the changes. Therefore, all exchange rate fluctuations have a 4-month depressing impact on the banking system stability. One may note that an increase in the exchange rate of 1 UAH leads to a decrease in currency deposits of almost 0.54 bln. (coefficient β_1) (USD in the current period, about 0.55 bln. (coefficient β_2); USD in the next period, by 0.67 bln. in the next 2 months ($\beta_3 + \beta_4$). The decrease in deposits in February and July 2014 can be measured as 0.42 bln. USD per month (β_5).
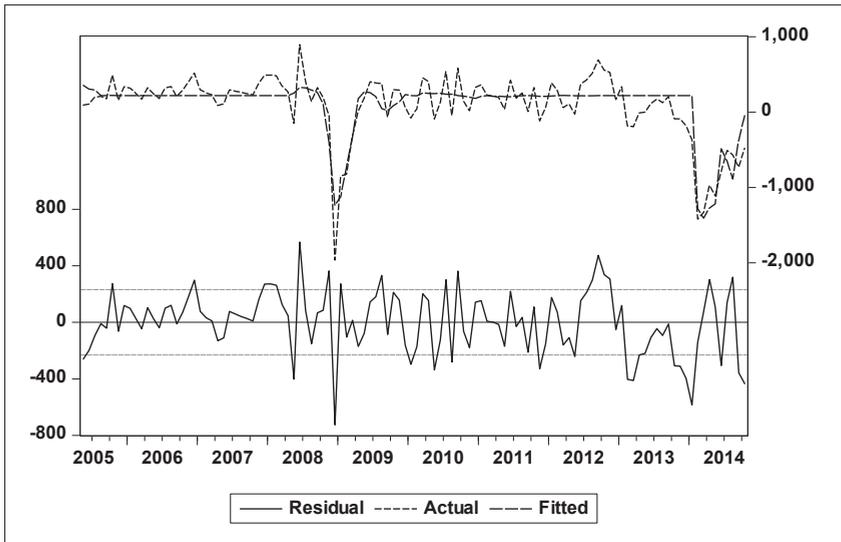
FIG. 6. **Graphical illustration of the model (Eq. 5)**

The model helps us formulate the following conclusions:
- the most important factor for currency deposits in Ukraine is reliability. Households try to save their money in any case; therefore, they are afraid of a banking crisis. They do not trust banks, and in the case of devaluation they try to take deposits back. They prefer to keep them at home during hard times;
- one should not expect a quick return on currency deposits in banks because, according to the model, households will return money only after four months of exchange rate stability. In 2014, in Ukraine there were two exchange rates: official and black market ones. As long as these two rates stay different, one cannot expect stabilization in the market. One more negative expectation is the coming decline of GDP in 2015 that should lead to a further devaluation of the local currency. According to the model, this will decrease currency deposits further.

Can the government lower the dollarization level?

The third model concerns the question of whether the government can lower the dollarization level in the country. According to the terms described above, we analyse the variable DDI (HFCD/M2) (Fig. 1). Despite the policy of the Ukrainian government, the dollarization level has increased since 2008 after the world financial crisis. After the enactment of the new Law of Ukraine on Household Deposit Guarantee System, we observed a dramatic increase in the dollarization level because of legalization of household savings (the increased amount of compensation for deposits in US dollars forced households to shift from cash dollarization to financial dollarization). Unfortunately, the unstable political and economic situation led to the withdrawal of currency deposits from banks, and the DDI decreased to the level of the end of 2012. In

any case, such a level is rather high for the economy. This can be explained by the huge black market economy where almost all payments are made in US dollars.

The exchange rate (ERATE, UAH) and different kinds of shocks have the main impact on the DDI (HFCD/M2), bln UAH. We also included two dummies in the model. The first one describes a significant increase in UAH deposits at the end of each year (SEAS). The influence has just a seasonal effect which can be explained by the features of the Ukrainian budget system. The second one investigates a complicated period for the banking system since February 2014 when the Revolution began (S_2014). Additionally, we included the change in the real monetary base into the final equation (Eq. 6). This helps reveal the influence of monetary policy and increasing of hryvnia deposits as well. Finally, the change in FCD (PUSD, %) seems to be significant in the model.

$$
\begin{aligned}
\Delta DDI_t = \beta_0 &+ \beta_1 \Delta ERATE_t + \beta_2 S\_2014_t + \beta_3 SEAS_t \\
&+ \beta_4 \Delta \frac{M2_t}{TOTAL\_INFL_t} + \beta_5 \Delta PUSD + \varepsilon_t
\end{aligned}
\tag{6}
$$

The model seems to be significant (Prob(F-statistic) < 0.05), all coefficients are significant with 95 and 99% levels. As standard OLS provided heteroscedastic and serially correlated residuals, the model was reestimated by the GLS method (Table 5).

According to the model, we can see that the change in the exchange rate has a positive impact on the dollarization level (Table 5, Fig. 7). We show that in the case of devaluation, many households convert their savings into USD, so the increase in the DDI (HFCD/M2) is rather clear. The effects of 2014 and the last month of each year were analysed above. Each 1 bln. in real M2 leads to a decrease in the DDI of 0.02% (β_4). The increase of USD deposit rates (PUSD) by 1% can increase the DDI by only 0.004% (coefficient β_5). The model also shows that during 2014 the DDI (HFCD/M2) decreased by 1.1% per month. In December, one can expect an additional 0.6% dollarization decrease.

TABLE 5. **Final estimation of the model (Eq. 6)**

Coefficient	Coefficient value	Std. Error	t-Statistic	Prob.
β_0	0.001138	0.000462	2.465223	0.0152
β_1*	0.015675	0.002474	6.335690	0.0000
β_2*	−0.011640	0.002270	−5.127540	0.0000
β_3*	−0.006224	0.001653	−3.765647	0.0003
β_4*	0.000000244	0.000000101	−2.420014	0.0171
β_5*	0.003903	0.001525	2.558435	0.0119

R-squared	0.613543	Durbin–Watson stat	1.370950
F-statistic	35.24491	Prob(F-statistic)	0.000000

Notes. The asymptotic t-statistics in parentheses have a standard normal distribution. The t-statistics in square brackets are based on standard error estimates (OLS estimates).

* Statistical significance at the 1% level.

FIG. 7. **Graphical illustration of the model (Eq. 6)**

One can conclude that only the stability of the exchange rate and the stable performance of economy can stop the decreasing dollarization level, at least in 2015. Most experts forecast the further devaluation of the local currency. In our opinion, the scenario with withdrawing FCD will decrease the financial dollarization level, but cash dollarization will increase. That is why financial dollarization is better than dollarization as a whole.

4. Discussion and conclusions

In this paper, we have estimated the financial dollarization level (only in the context of banks–households) in Ukraine during the past decade and its influence on the banking system. The results demonstrate that the financial dollarization level depends on many factors which can be divided into two groups: on the side of deposit dollarization and on the side of loan dollarization. We find that deposit dollarization can be explained by the ratchet effect, reliability, international labour migration, shadow economy, and corruption. All these factors lead to the growth in deposit dollarization in the period of economic and political stability. Alternatively, in case of instability, deposit dollarization quickly converts into cash dollarization, so banks face bank runs. FCD run faster than DCD due to the mistrust in the banking system and due to the peculiarities of reimbursing FCD in case of bank failure.

The causes of loan dollarization are protecting against inflation, producing a high profitability comparing with European markets, and minimizing currency risks in case

of funding in foreign currencies. In case of sharp devaluation, all these factors could be crossed out due to the growth in credit and liquidity risks. Such a situation was observed in Ukraine twice: in 2008–2009 and in 2014.

The investigation shows that the situation in the banking sector will remain difficult, especially in the first half of 2015. The expected decrease in GDP, devaluation of the local currency, and bank runs will continue. Households need stable conditions to invest again into banks. The situation with DCD will stabilize much sooner than with FCD. The last ones require at least four months of stable economic and political conditions to start growing. At the same time, one needs just a change in household expectations to return hryvnia deposits to banks. For such a purpose, the NBU should prove its strategy direction for inflation targeting at the appropriate level. Foreign investment and stabilizing credit should play a key role in forming positive expectations of households; therefore, the Ukrainian government should attract them as soon as possible.

Our research has also shown that it is impossible to conclude unequivocally that the financial dollarization has more negative than positive effects. It depends on the conditions that exist in the economy and the level of volatility in exchange rates. The paradox lies precisely in the fact that in stable conditions it is certainly a positive effect both for deposit and loans sides. In the context of a sharp devaluation of the national currency, we get the opposite effect because of problems with foreign currency loans. Accordingly, the problem of foreign currency loans in banks is a further problem with the return of foreign currency deposits to households, especially in the situation of low foreign exchange flows to the country.

Financial dollarization is a phenomenon that cannot disappear, the use of administrative methods will not give the desired effect and can only lead to running household deposits from banks, which is continuing at the moment in Ukraine. So, it's time to think how we can reduce the negative consequences of this phenomenon and use it to restore the economy after a severe crisis.

REFERENCES

Alvarez-Plata, P., García-Herrero, A. (2007). To dollarize or de-dollarize: Consequences for monetary policy. Research Paper. Paper prepared for the Asian Development Bank.

Burnside, Cr., Eichengreen, B., Rebelo, S. (2001). Hedging and financial fragility in fixed exchange rate regimes. European Economic Review, No. 45 (June), pp. 1151–1193.

Calvo, G., Reinhart, C. (2002). Fear of floating. Quarterly Journal of Economics, No. 117 (2, May), pp. 379–408.

De Nicoló, G. Honohan, P. Ize, A. (2003). Dollarization of the banking system: Good or bad? IMF Working Paper, No. 03/146.

Eichengreen, B. (2002). When to dollarize. Journal of Money, Credit and Banking. Vol. 84, February, pp. 1–24.

Eichengreen, B., Hausmann, R. (1999). Exchange rates and financial fragility. NBER Working Paper No. w7418, http://www.nber.org/papers/w7418.

Gulde, A.M., Hoelscher, D., Ize, A., Marston, D., De Nicoló, G. (2004). Financial Stability in dollarized economies. Occasional Paper 230. Washington, D.C.: International Monetary Fund.

Honohan, P., Shi, A. (2003). Deposit dollarization and the financial sector in emerging economies. Globalization and National Financial Systems, New York: Oxford University Press.

Ize, A., Levy-Yeyati, E. (1998). Dollarization of financial intermediation: Causes and policy implications. IMF Working Paper 98/28.

Levy-Yeyati, E. (2006). Financial dollarization: Evaluating the consequences. Economic Policy, January, pp. 61–118.

Versal, N. (2012). Is today the post-crisis time for the banking system of Ukraine? Collection of Papers 2012 – Volume I: The 13th Annual Doctoral Conference, Faculty of Finance and Accounting, University of Economics, Prague, Oeconomica Publishing House, 1st edition, pp. 181–187.

Bazylevych, V. (2009). The development of the financial market under current conditions. Finance of Ukraine, No. 12, pp. 5–12.

Vasylchenko, Z., Tereshenko O. (2013). Financial instability and its impact on the credit portfolio management in Ukrainian banks. Finance and Credit Activities: Problems of Theory and Practice, Issue 2, pp. 12–23.

Mishchenko, V., Somik A. (2007). Dollarization: causes and consequences for the economy of Ukraine. Bulletin of the National Bank of Ukraine, No. pp. 5, 28–31.

Zoryan, H. (2005). The measurement of co-circulation of currencies and dollarization in the Republic of Armenia. European Journal of Comparative Economics, Vol. 2, No. 1, pp. 41–65.
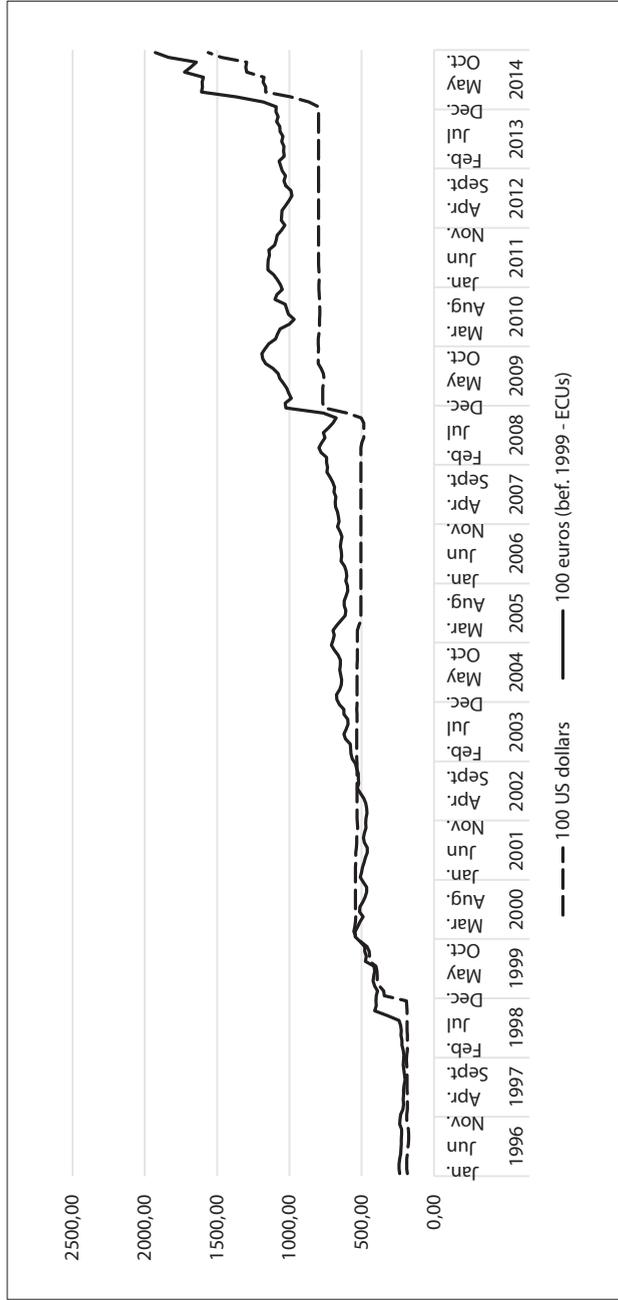
FIG. A1. **Trends of monthly average of official foreign exchange rates of 100 Ukrainian hryvnias**

Source: the National Bank of Ukraine: http://www.bank.gov.ua/control/uk/curmetal/detail/currency?period=daily

APPENDIX B

TABLE B1. **Descriptive statistic of analysed variables**

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Sum	Sum Sq. Dev.	Observations
DDI	0.203452	0.211895	0.249425	0.148076	0.026939	-0.434064	1.867374	10.01273	0.006695	24.00729	0.084905	118
DEP_UAH	127183.3	117794.4	257829.0	23587.00	65104.95	0.247355	2.049488	5.645370	0.059446	15007631	4.96E+11	118
DEP_USD	14657.79	14957.21	23394.39	3896.190	5500.564	-0.227708	2.200774	4.160316	0.124910	1729619	3.54E+09	118
ERATE	7.098188	7.912550	13.60578	4.843070	1.984533	0.886953	4.018412	20.57086	0.000034	837.5862	460.7896	118
INFL	100.8458	100.6000	103.8000	98.70000	1.033428	0.836576	3.198808	13.95822	0.000931	11899.80	124.9529	118
M2	520867.5	482496.5	1011140.	125501.2	246119.8	0.149829	2.001011	5.348218	0.068968	61462362	7.09E+12	118
PUAH	12.52462	12.37305	19.95270	6.500000	4.093877	0.069667	1.620382	9.453565	0.008855	1477.905	1960.900	118
PUSD	7.472808	7.025650	10.74160	5.798400	1.297996	1.237183	3.451745	31.10560	0.000000	881.7913	197.1209	118
TOTAL_INFL	1.822899	1.963902	2.685036	1.017000	0.486096	-0.354115	1.665784	11.21846	0.003664	215.1021	27.64588	118

Source: authors' calculations based on data from the NBU.

TABLE B2. **Augmented Dickey–Fuller test probabilities**

Series	Prob. for levels	Prob. for first differences
DDI	0.3905	0.0000
DEP_UAH	0.7325	0.0000
DEP_USD	0.3211	0.0005
ERATE	0.9885	0.0000
INFL	0.0003	0.0000
M2	0.9737	0.0000
PUAH	0.8325	0.0000
PUSD	0.2533	0.0000
TOTAL_INFL	0.9605	0.0000

Source: authors' calculations based on data from the NBU.
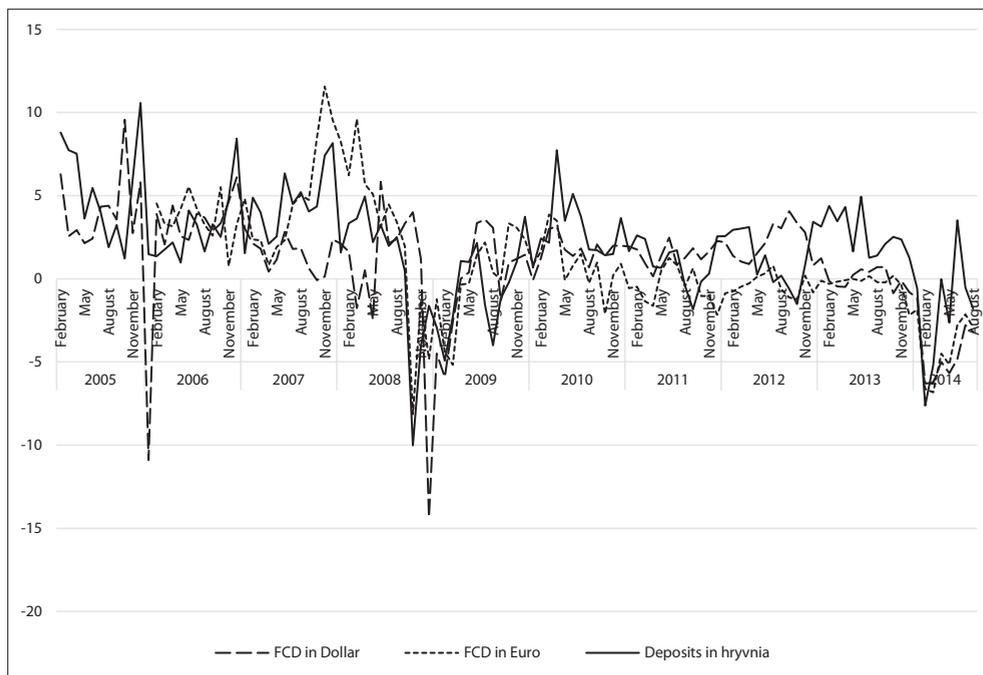
FIG. C1. **Trends of month-over-month percentage increase of FCD in dollar, euro and deposits in hryvnia**

Source: authors' calculations based on data from the NBU.
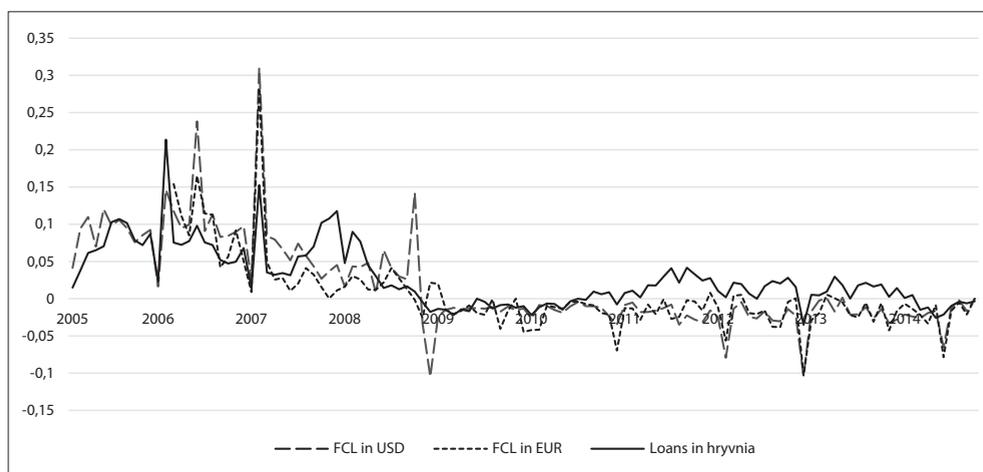
FIG. C2. **Trends of month-over-month percentage increase of FCL in dollar, euro and loans in hryvnia**

Source: authors' calculations based on data from the NBU.