

Determinants of Household Bank Deposits: Evidence from Slovakia

Renáta Pitoňáková

Abstract—Article copes with household bank deposits in Slovakia applying quarterly data Q2 1998 – Q1 2015 using the ARDL methodology. The results show that real interest rate, elderly dependency ratio, inflation and gross disposable income boost up deposits, while income growth reduces household deposits. Outcomes indicate that elder generation tends to increase financial wealth if form of bank deposits.

Index Terms—ARDL, deposits, households, income.

I. INTRODUCTION

Bank deposits are one of possible forms of financial wealth of economic subjects. For commercial banks deposits are low cost finances while for investors they represent liquid and safe assets [1]. Interest rates on bank deposits are the lowest rates of return investors are willing to accept. A downward tendency of interest rates of the European Central Bank (ECB) to negative values for deposit facilities of credit institutions (-0.40 % p. a.) reveals debates about plausible limits which these falling rates can approach and, possible consequences for banks when being induced to impose negative rates for customers. Higher opportunity costs can either draw deposits out of banks mainly those held for speculative and precautionary motives and increase demand for bank products and services for liquidity management (checking accounts), or leave deposits substantially unchanged due to the acceptance of risk and corresponding lower earnings.

Bank deposits obviously involve checking accounts, saving accounts and time deposits. Checking accounts (overnight accounts) are preferably used for payment and settlement purposes, short-term deposits for speculative reasons and long-term deposits for precautionary motives. A sound financial market provides private sector (households and corporates) with a set of different investment opportunities and motivates to use liquid assets with banks mainly for transaction purposes.

Thus for households in Slovakia checking accounts are in spite of low interest rates the most preferable bank accounts amounting to the half of their total bank deposits, and additionally, a report of the Deutsche Bundesbank from 2015 indicates that saving behaviour of households in Germany did not dramatically change due to low interest rates.

Working papers devoted to bank deposits are missing in Slovakia. Some outcomes are published by the National Bank of Slovakia in general, or are available in form of

papers prepared mostly by foreign researchers dealing with Slovakia within a group of countries.

The aim of this article is to identify determinants of bank deposits of households in Slovakia based upon income and saving theory with the application of the Autoregressive Distributed Lag framework. The structure of the article is the following. After the introductory part there is an overview of corresponding literature, part three describes variables and model. The fourth one comments upon achieved results, the last part concludes.

II. LITERATURE OVERVIEW

Empirical investigations of bank deposits are performed either within money demand theory and results are presented in [1]-[4] or consumption theories with outcomes presented in [5]-[7]. According to [8] within money demand approaches, the empirical estimations underline the transactions and asset theories. The transactions theory considers money as medium of exchange dealing with narrow money (M1) and suggests income variable and short-term interest rate, while the asset theory prefers broad money (M2, M3), wealth and yields on longer-term financial assets. Theories of consumption involve Absolute Income Hypothesis (AIH) elaborated by [9], Life-Cycle Hypothesis (LCH) in [10], Permanent Income Hypothesis (PIH) by [11], and [12] deals with Relative Income Hypothesis (RIH). According to [9] within the Transaction motive entities hold liquid assets to bridge the interval between the receipt of income and its disbursement. Within the Precautionary motive liquidity is held to provide for contingencies requiring sudden expenditure and for unforeseen opportunities of advantageous purchase. The Speculative motive expresses desire to hold resources in liquid form to take advantage of changes in the interest rate or bond prices. The aggregate of liquidity depends on the amount of income and the normal length of the interval between its receipt and its disbursement. Then, the prime reason for holding an inventory of money is the lack of synchronization between payments and receipts [13]. People prefer holding money over commercial papers or real assets because money manifests the highest liquidity. [9] outlines eight motives why people save. These are: to build up a reserve against unforeseen contingencies; to provide for an anticipated future relation between the income and the needs of the individual or his family; to enjoy interest and appreciation; to take advantage of rising expenditure for improving standard of life; to enjoy a sense of independence and the power to do things; to secure a *masse de manoeuvre* for speculative or business projects; to bequeath a fortune; to

Manuscript received June 19, 2016; revised August 25, 2016.

Renáta Pitoňáková is with Comenius University in Bratislava, Faculty of Social and Economic Sciences, Slovakia (e-mail: renata.pitonakova@fses.uniba.sk).

satisfy pure miserliness. [14] points out general motives such as saving for retirement, precautionary saving, saving for bequest and a target saving to acquire tangible assets.

Psychological motives such as consumption behaviour of individuals or perception of advertisement of financial institutions are possible factors influencing saving manners.

Determinants of household savings can be grouped into following categories [14]: *demography* such as young dependency ratio, elderly dependency ratio, and total dependency ratio; *economic indicators*: income, inflation, unemployment, interest rate, financial market statistics; and data from the *statistics of households* such as education, gender. According to [15] the relation between the working and nonworking populations (retired and too young for regular employment) is the most important factor because the latter group tends to reduce saving, since it consumes without producing income. The magnitude of income in the consumption and saving is expressed by income hypotheses. Increasing inflation requires putting more money on present consumption and reduces consumption in the future. Inflation deteriorates saving, but the impact may be positive if inflation serves as factor of uncertainty. Similarly like inflation, unemployment serves as proxy for precautionary motive (higher unemployment tends to increase saving). Rising real interest rate stimulates economic subjects to save more. [16] were searching for determinants for household saving in Australia. Their results showed that current income was the most important determinant of saving, with a role for demographics and householders level of economic optimism. In [17] a positive relationship was identified between saving rates and lifetime income. Public and corporate saving, growth, and demographics along with inflation, unemployment, real interest rate, and financial deregulation determined the household saving in OECD countries with a special attention paid to social security and tax system [18]. [19] assert that people with higher education are assumed to have higher incomes and higher saving. A publication by [20] dealt with household saving in Estonia, their results revealed the importance of liquidity constraints of households in developing countries and that young and in particular older households had higher propensity to save than middle-aged households, while higher education was associated with lower savings. [21] investigated the household saving in Australia and revealed the following: households' saving ratios increased with income, but decreased with wealth and gearing.

Ref. [5] published a technical study on the determinants and outlook of private sector deposits in the Greek banking system using a vector error correction model with the following outcomes: a strong positive link was identified between deposits and bank credit to the domestic private sector in the periods before and after the eruption of the sovereign debt crises, and a strong positive link between bank deposits and the level of Gross National Product (GNP). A paper of [22] inspected the relation between demand deposits and liquid assets. The analysis brought about surprising achievements, as banks with relatively more demand deposits had relatively less liquid assets. Determinants of Islamic and conventional deposits in the Malaysian banking system were identified by [6]. The

findings showed that in most cases, customers of conventional system behaved in conformity with the savings behaviour theories. Paper elaborated by [7] focused upon determinants of non-resident deposits in commercial banks in Lebanon and brought about the following: the non-residents' deposits were shaped differently between domestic and foreign currency; bank assets, interest rates, and some adverse political situations affected non-resident deposits in all its measures. A relationship between macroeconomic determinants and bank deposits in Nigeria were modelled in study of [1]. The results showed that bank investment, bank branches, interest rate and the general price level were important determinants. A paper inspecting determinants of manufacturing deposits in Slovakia was prepared by [3]. The article presents the following: in the long-run bank deposits declined with rising long-term interest rate, wages and prices and, increased with higher receipts. Lagged values of receipts, wages and prices were important determinants of deposits in the short-run.

III. VARIABLES AND MODEL

For modelling relation among household bank deposits and selected variables following data were taken from databases of National Bank of Slovakia (NBS), Statistical Office of the Slovak Republic and Economic Research of Federal Reserve Bank of ST. LOUIS: Household bank deposits, Average interest rate on household deposits, Inflation, Dependency ratio of elderly, Gross household disposable income and Growth of household disposable income. Fig. 1 deploys household bank deposits in log (D) deflated by Consumer Price Index (CPI), seasonally adjusted by Census X12. Fig. 2 displays the average real interest rate on household bank deposits (IR) deflated by the CPI.

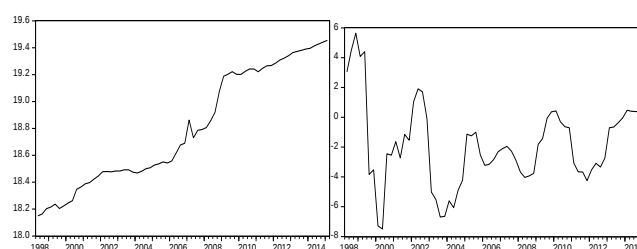


Fig. 1. Deposits (in log).

Fig. 2. Real Interest Rate.

Source: Database of the National Bank of Slovakia (NBS).

The graph shows a gradual rising course of deposits. A slight damping is observable since 2002 up to Q1 2004 also resulting from preparations for joining the European Union (EU) in May 2004 and performing required macro measures such as tax reform (unification of VAT rates from 22 % to 19 %), flat tax introduction (19 % on income both to corporates and individuals), consolidation of public finances, appreciation of Slovak currency towards US Dollar, euro and interest rate declines. Fig. 2 depicts three periods where average real interest rate achieved negative values. These are Q3 1999 – Q4 2001; Q4 2002 – Q3 2009, and Q2 2010 – Q4 2013. The first interval was remarkable for higher inflation caused by the introduction of import tax, changes in regulated prices (rise in prices of electrical and heating

energy, post offices, water-rate and sewerage), and the growth of oil prices in 2000. In the second period Q4 2002 – Q3 2009 the path of real interest rate reflected the changes in the key interest rates of the NBS on money market (gradual decline of rates of interest to approach rates of the Eurozone). Lately, the interest rate was negative due to continuous decline in the interest rates of the ECB aiming to support economic growth, employment and to divert from deflation. Fig. 3 deploys the annual inflation rate expressed by CPI and Fig. 4 the path of dependency ratio of elderly (DE).

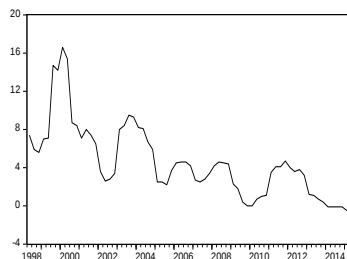


Fig. 3. Inflation rate (%)

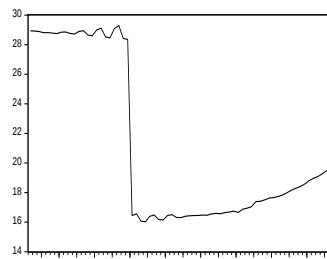


Fig. 4. Dependency ratio of elderly (%)

Source: Database of the National Bank of Slovakia (NBS); Statistical Office of the Slovak Republic, and the Economic Research of Federal Reserve Bank of ST. LOUIS.

A remarkable increase of inflation rate to 14.2 % was captured in 1999. In Q1 2000 the inflation rate peaked up to 16.6 % because of continuous increases in prices of crude oil and energy. Inflation targeting came to light as a moderate inflation rate in coming periods. In 2009 financial crisis, decline in real GDP and lower prices of manufacturing commodities influenced the annual inflation rate (0.9 %).

Fig. 4 shows that at the beginning of the observation period, dependency ratio (DE) was quite stable up to 2004. Within a pension reform in 2004 the retirement age for men and women was unified to 62 since 2014. Fig. 5 presents the tendency of the gross real disposable income of households in log, seasonally adjusted by Census X12, and Fig. 6 deploys the annual growth of the household disposable income (the same quarter of the previous year).

The current disposable income has a rising tendency with some slight deviations due to measures associated with the integration processes of Slovakia.

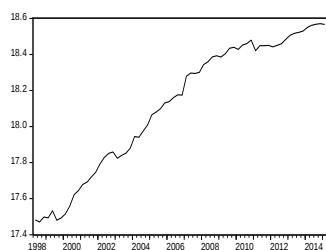


Fig. 5. Real disposable income (in log).

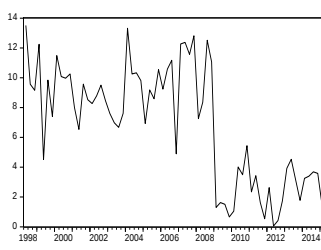


Fig. 6. The annual growth of disposable income (%).

Source: Database of the National Bank of Slovakia (NBS) and Statistical Office of the Slovak Republic.

The highest growth was achieved in Q2 1998 (about 13 %) attributed to working positions offered by foreign companies and government expenditures.

Inspections into household deposits will be provided by ARDL technique presented by [23], [24]. This approach enables to identify cointegration relation in small samples and can be applied to regressors of I(1) and I(0). In ARDL procedure variables can have different number of lags. This framework requires the existence of long-term relationship among variables. According to [23], [25] a form of the ARDL model without trend is as follows:

$$Y_t = \beta_0 + \sum_{k=1}^r \chi_k Y_{t-k} + \sum_{m=0}^s \delta_m X_{t-m} + u_t \quad (1)$$

where Y - endogenous variable; β_0 - intercept; χ_k , δ_m - coefficients; X - set of regressors; u_t - error term.

The ARDL model helps studying the short-run reaction and the long-run reaction that are important in many economic problems. ARDL can be reproduced to ECM ARDL version by transforming variables (1) into differences and lags. The ECM includes variables in first differences and an error-correction term. Equation (2) displays unrestricted ARDL ECM structure applied for identifying short and long-term relations among variables.

$$\begin{aligned} \Delta D_t = & \alpha_0 + \sum_{j=1}^m \beta_j \Delta D_{t-j} + \sum_{j=0}^m \gamma_j \Delta DE_{t-j} + \sum_{j=0}^m \delta_j \Delta INF_{t-j} + \\ & + \sum_{j=0}^m \varepsilon_j \Delta DI_{t-j} + \sum_{j=0}^m \zeta_j \Delta DIG_{t-j} + \sum_{j=0}^m \eta_j IR + \lambda_1 D_{t-1} + \lambda_2 DE_{t-1} + \\ & + \lambda_3 INF_{t-1} + \lambda_4 DI_{t-1} + \lambda_5 DIG_{t-1} + \lambda_6 IR + u_t \end{aligned} \quad (2)$$

where Δ : first difference operator; α_0 : intercept; β , γ , δ , ε , ζ , η : coefficients of short-run relation; $\lambda_1 - \lambda_6$: coefficients of long-run relation; u_t : error term; D : Total deposits of households (seasonally adjusted, transformed into log, deflated by CPI), Total deposits involve *Overnight deposits*, *Deposits with agreed maturity* and *Deposits redeemable at notice*; DE : Elderly Dependency Ratio (ratio of the population aged 65 or older to the working age population 15 - 64); INF : Inflation rate measured by CPI (Year-on-year change); IR : Interest rate (average interest rate on deposits deflated by CPI); DI : Gross household disposable income in real terms deflated by CPI, seasonally adjusted, transformed into log); DIG : Growth of household disposable income (the same quarter of the previous year). The restricted ARDL ECM model involving error correction term (ECT) is the following:

$$\begin{aligned} \Delta D_t = & \alpha_0 + \sum_{j=1}^m \beta_j \Delta D_{t-j} + \sum_{j=0}^m \gamma_j \Delta DE_{t-j} + \sum_{j=0}^m \delta_j \Delta INF_{t-j} + \\ & + \sum_{j=0}^m \varepsilon_j \Delta DI_{t-j} + \sum_{j=0}^m \zeta_j \Delta DIG_{t-j} + \sum_{j=0}^m \eta_j IR + \omega ECT_{t-1} + u_t \end{aligned} \quad (3)$$

where: Δ - first difference operator; ω - speed of adjustment; ECT - Error correction term: lag residuals from the long-run relationship.

ARDL procedure needs to set appropriate lags of variables. According to the AIC criterion five lags should be appropriate (Table I).

TABLE I: LAG SELECTION CRITERIA

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-464.1706	NA	0.122310	14.92605	15.13016	15.00633
1	-49.74353	736.7593	7.45e-07	2.912493	4.341249*	3.474430
2	-18.21571	50.04416	8.86e-07	3.054467	5.707872	4.098064
3	15.27444	46.77988	1.04e-06	3.134145	7.012198	4.659402
4	117.0792	122.8121*	1.51e-07	1.045104	6.147806	3.052022*
5	166.0705	49.76896	1.33e-07*	0.63268*	6.960032	3.121259

* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion. Note: Outcomes from EVIEWS 9.

TABLE III: PESARAN CRITICAL VALUE BOUNDS FOR F-STATISTIC

	90%		95%		99%	
K	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5	2.26	3.35	2.62	3.79	3.41	4.68

Source: [24].

Table II presents the results from the Unit root tests (the ADF test by [26] and PP test by [27]). The results show that D is I(1), DE I(1), DI I(1), INF I(1), DIG I(0). Additionally, for deciding the order of integration of IR where ADF and PP tests gave different results, test of [28] was applied. Zivot-Andrews test statistic - 6.291; 1%, 5% and 10% critical value: - 5.57; - 5.08; - 4.82. The results reject the null of unit root.

TABLE II: RESULTS FROM ADF AND PP UNIT ROOT TESTS

	ADF test (p values)					
	D	DE	INF	DI	DIG	IR
c	0.9155	0.5189	0.3159	0.4327	0.0231	0.0000
ct	0.7081	0.8919	0.0003	0.9848	0.0029	0.0001
diffc	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
diffct	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	PP test (p values)					
	D	DE	INF	DI	DIG	IR
c	0.9108	0.5086	0.2837	0.4132	0.0378	0.0277
ct	0.6092	0.8714	0.0722	0.9871	0.0024	0.1671
diffc	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
diffct	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

Note: Outcomes from EVIEWS 9.

The F- test was used to test the null hypothesis of no cointegration against the alternative of cointegration.

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$$

$$H_1: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$$

According to [23] if the computed Wald or F-statistic falls outside the critical value bounds, a conclusive inference can be drawn without needing to know the

integration/cointegration status of the underlying regressors. However, if the Wald or F-statistic falls inside these bounds, inference is inconclusive and knowledge of the order of the integration of the underlying variables is required before conclusive inferences can be made. Table III deploys Critical Value Bounds for the F-Statistic used for testing the existence of a long-run relationship.

The computed F-statistic (4.48) is higher than the upper bound value at 95 % tabulated by [24] for unrestricted intercept and no trend for five variables without lagged dependent variable. This confirms long-run equilibrium among variables.

IV. INTERPRETATION OF RESULTS

Table IV presents the results from ECM ARDL estimations (equations 2 and 3) after applying General-to-specific (Gets) approach.

TABLE IV: RESULTS FROM ECM ARDL MODELS

	ECM RDL unrestricted	ECM ARDL restricted
Variable	ΔD	ΔD
c	-4.658*** [-4.252]	
D (-1)	-0.312*** [-4.190]	
DE (-1)	0.005** [2.620]	
INF (-1)	0.021*** [4.445]	
DI (-1)	0.572*** [4.602]	
DIG (-1)	-0.004** [-2.121]	
IR (-1)	0.014*** [3.301]	
ΔD (-2)	0.258** [2.347]	0.294*** [3.097]
ΔDE	0.005* [1.791]	0.005* [1.896]
ΔINF	-0.010*** [-3.583]	-0.012*** [-4.717]
ΔDI (-3)	0.497** [2.532]	0.485*** [3.472]
ECT (-1)		-0.335*** [-4.421]
R ²	0.45	0.36
Adj R ²	0.35	0.32
No	64	64

Note: ***, **, * imply significance at 1%, 5%, 10% levels respectively, t-statistic in parentheses. Estimations in EVIEWS 9.

The coefficient of adjustment (ECT) is negative and significant and shows that almost 34 % of disequilibrium in the previous quarter will be corrected in the current quarter. A positive relation was identified between Deposits and Elderly dependency ratio both in the long- and short-run. Higher proportion of people aged 65 and over on the working age population (15-64) enhance deposits. This stands in contradiction to the assumption of the LCH that elderly population should be dissaving thus bank accounts should be dropping off. This contradiction has been presented in studies elaborated by [3], [19], [29]-[32]. Elder generation tends to

save in the retirement for a bequest motive. In the long-run bank deposits are under a positive impact of higher inflation expressing precautionary saving motives of households. If the current gross disposable income is rising, households are increasing their financial wealth in form of bank deposits. A negative relation was identified among deposits and the growth of household income. Deposits are increasing with rising real interest rate which stimulates households to put finances on bank accounts. The elasticity of variables from (2) identifies impact of explanatory variables upon dependent variable. The elasticity between deposits and dependency ratio of elderly (DE) is (0.017), inflation (INF) (0.07), disposable income (DI) (1.83), the growth of disposable income (DIG) (- 0.01), and finally between deposits and real interest rate (IR) (0.05). Then one percentage point increase in elderly ratio (DE) pushes up the bank deposits almost by 0.02 per cent or if disposable income increases by one percent deposits will grow up by about two percent.

The p-value (0.402) of the autocorrelation BG-test by [33], [34] and the p-value (0.538) of the heteroscedasticity BP-test by [35] shows that the null hypothesis of non-autocorrelation and homoscedasticity is not rejected.

V. CONCLUSION

Economic subjects have different motives to hold financial wealth in form of liquid assets on bank accounts. Households prefer bank deposits as low risky financial instruments. Overnight deposits are by corporates used mainly for transaction purposes. In Slovakia households prefer overnight deposits in spite of low interest rates. Progress in information technologies and their fast implementation into banking industry mainly in the payment and settlement procedure stimulate economic entities to use cashless payment forms. The knowledge about determinants of bank deposits is of interest to public, credit institutions for maintaining financial sources and for governing bodies in conducting monetary policy.

ACKNOWLEDGEMENT

This work was supported by the Slovak Research and Development Agency within APVV-14-0020 and Scientific Grant Agency within VEGA 1/0446/15.

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Renáta Pitoňáková graduated from University of Economics in Bratislava and Comenius University in Bratislava. She teaches courses on banking. Her research focuses on finances, monetary policy and competitiveness. Professor Pitoňáková is a member of the Scientific Board at the Faculty of Social and Economic Sciences, Comenius University in Bratislava and member of the Committee for the Doctoral Study at the Faculty of Commerce, University of Economics in Bratislava.