Journal of Economics, Business & Organization Research

Year:2022, Vol:4, Issue:1, pp. 54-71

Article Type: *Research*

Citation: *Gecer, T. (2022). Term Structure of Deposits in Turkish Banking System. Economics, Business and Organization Research, 4(1), pp. 54-71*

TERM STRUCTURE OF DEPOSITS IN TURKISH BANKING SYSTEM

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Abstract

This paper studies the term structure of deposits in Turkish banking system. It also discusses the concepts of nominal maturity and effective maturity of deposits. It assumes that the main factors configuring the effective maturity of deposits are the dollarisation of deposits, the net interest return of domestic currency deposits, the volatility of foreign exchange currencies against domestic currency and the reserve requirement mechanism. This study recommends that extending the effective maturity of deposits rather than the nominal maturity of deposits is more likely the best strategy for Turkish banks. Every deposit has an embedded option to extend up to the effective maturity.

Keywords: *Deposits, Nominal Maturity, Effective Maturity.*

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Received: *11.08.2022* ***Accepted:*** *30.08.2022* ***Published Online:*** *31.08.2022*

1. INTRODUCTION

Banks play a vital role in the economy (Whitting, 1985, p.3). Overall, the literature provides broad empirical evidence of a positive relation between finance and economic growth (Thiel, 2001, 20). Banking is one of the most essential businesses all over the world. The banking sector is a backbone of the country's economy (Hamza and Khan, 2014, 444). It is for sure that as share of banking sector in financial system increases, the role of the sector in macroeconomic stability and economic growth also becomes more prominent (Sayılgan and Yıldırım, 2009, 207). Another important role of banks is in spurring growth (Franklin et al. 2008, 41). Clearly, better banking systems create a more stable environment by leading to a reduced likelihood of systemic banking crises and international currency crises (Watchel, 2001, 353) Traditionally, banks have been a key player in the financial system, transforming savings into long-term capital to finance private sector investment (OECD, 2013, 4). Banks, which are the building blocks of the financial system, manage the loanable fund supply and demand in economics through their 'mediation' function. Other important function of the banks in macroeconomic aspect is the fact that the provided funds to the financial system guide to sectors which will provide the most value to the economic growth (Işıl & Erik, 2017, 153). The primary role of banks is to take in funds-called deposits-from those with money, pool them, and lend them to those who need funds. Banks are intermediaries between depositors (who lend money to the bank) and borrowers (to whom the bank lends money). The amount banks pay for deposits and the income they receive on their loans are both called interest. A bank's most important role may be matching up creditors and borrowers, but banks are also essential to the domestic and international payments system-and they create money (Gobat, 2022). In the traditional model, banks take short term deposits and other sources of funds and use them to fund longer term loans to businesses and consumers (Saunders & Cornett, 2012, 19).

Banking is an art of managing the maturity mismatch, long-term lending by short-term funding. Banks try to lengthen the terms of funding. The longer-term maturity of funding, the longer-term maturity of lending. Banks have three main sources of funding: the deposits, the borrowings, and the equity. For commercial banks, deposits are the main source of funding, and thus the higher maturity of deposits is the most preferable. The higher maturity of deposits gives the banks a competitive advantage also in liquidity.

Deposits are also a crucial source of the expansion strategy for commercial banks. The short-term structure of deposits is a factor that accelerates a potential risk of maturity mismatch on banks' balance sheets. Deposits are mostly in the short-term and small because depositors prefer the shorter maturities due to ‘liquidity’ and ‘repricing’ concerns. For commercial banks, trying to roll over the maturity of a deposit may be less costly than taking a new deposit, not only in pricing but also the in operational reasons. In any stable economy, depositors perceive the commercial banks are the most liquid financial institutions, this perception leads depositors to greater preference for flexibility, early withdrawing, and shortening the maturity of deposits.

2. LITERATURE REVIEW

Academic studies in the international and national literature on deposits are included in this section. When academic studies are examined, it has been seen that there are very few studies on deposits both in Turkey and in the international literature. Summary information on the studies conducted from different perspectives on deposits is as follows.

Dhungana (2011) investigated the correlation of deposits and growth. Banking and economic data for the period 1990-2010 constitute the scope of the study. The conclusions reveal the positive correlation among the deposit portfolio of financial institutions, gross domestic product, and economic growth.

Voloshyn & Voloshyn (2013) proposed a model for determining optimum interest rates for individual deposits. Within the scope of the study, an approach is proposed in which the highest net interest income can be achieved for the bank by utilizing the interest rates in deposit cash flows.

Bayrakdaroğlu & Aydın (2017) investigated the results of deposit rates linked to the loan size of banks. In the analysis conducted using the financial data of the banks from 2006 to 2016, this was resulted that the interest rate given to deposit negatively affects the credit volume of the banks.

Batmaz et al. (2017) investigated the factors affecting the pricing processes of deposits in commercial banks. In the study, a commercial bank selected as an example with a data mining method was analyzed. According to the results, account and customer-specific features should be considered when determining deposit rates. In addition, it has been determined that customers who have longer-term correlations with banks benefit from higher deposit interest rates.

Arslan et al. (2019) conducted a study on deposit certificates used in Turkey for a while. They analyzed comparatively the practices of the countries where deposit certificates are used. They also made comments and opinions regarding its applicability in Turkey.

Yakubu & Abakor (2020) investigated the factors that are effective in the development of deposits in Turkey using the data for the period of 2000-2016. Conclusion of the study, short-term and long-term factors affecting deposit growth were determined. short-term factors: money supply and branch expansion, while long-term factors are listed as economic growth, money supply, stability, inflation, and productivity.

Haddawee & Flayyih (2021) analyzed the relationship between deposits and profitability. In the analysis conducted using the 5-year data of banks operating in Jordan, it has been determined that the deposit type that has the most impact on bank profitability is time deposits.

Kolesnik et al. (2021) developed a method for analyzing deposit portfolios of commercial banks. For this purpose, he analyzed the deposit portfolio of a commercial bank selected as an example with the author. The results show that the deposit portfolio should be analyzed first to analyze the efficiency of the deposit policies of the banks. In addition, a model proposal was made because of the study.

Er (2022) conducted a study on deposit agreements concluded between banks and depositors. In the study, the definition of deposit, the legal regulations regarding deposit, the content, and elements of the deposit agreement are included.

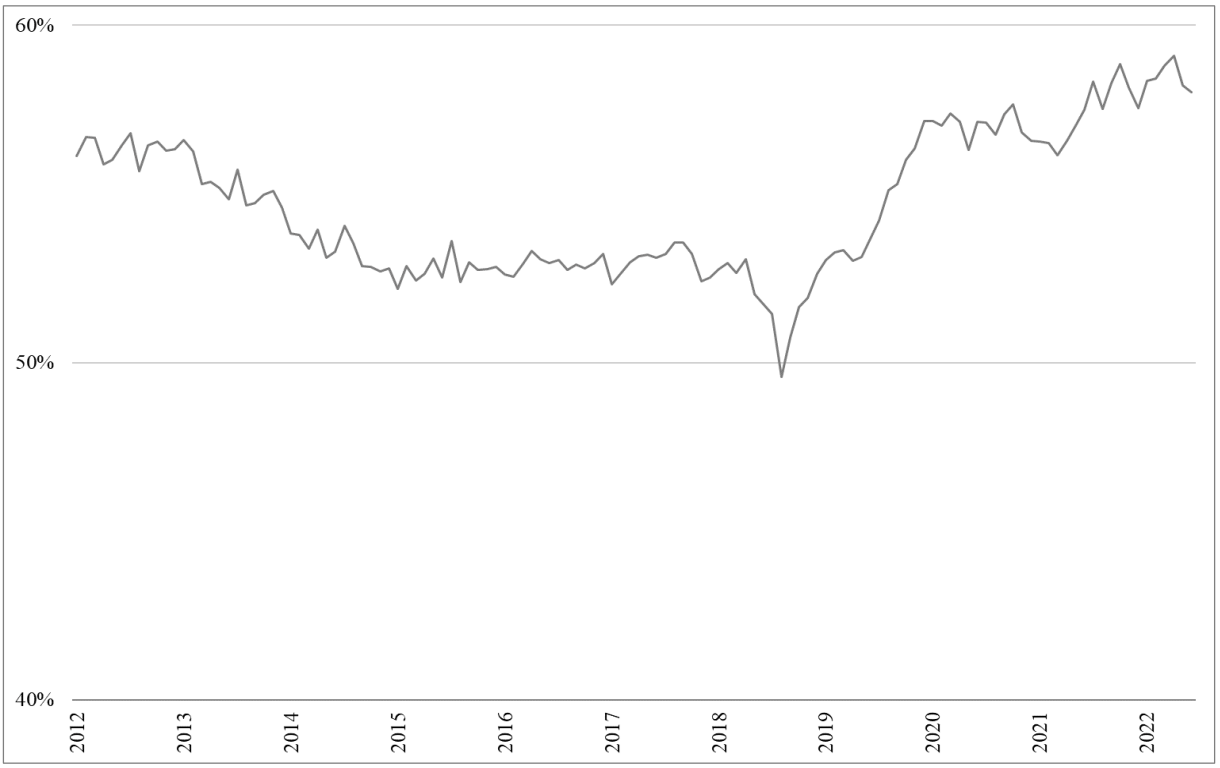
3. IMPORTANCE OF DEPOSIT MANAGEMENT IN BANKS

Asset-liability management requires to give equal importance to both assets and liabilities. Technically, banks could omit the liability side or could focus mostly the borrowings on the liability side.

Considering the data for June 2022 (See Graph 1), the ratio of total deposits to total assets is 58.22% and approximately 2/3 of liabilities are made up of deposits. Banks should not underestimate the deposits and appreciate the importance of financing assets side. From the perspective of liability management, one of the most important items is the deposit management. The main reason is that deposits are important for banks' risk management is their mobility. While deposits can move within or between banks, they can also go out of the banking system. The displacement of deposits within the bank may be between branches, time-demand

deposit transfer, domestic currency vs. foreign currency transfer, or switching to various products. Intra bank shift of deposits may occur due to the interest rate advantage.

Graph 1. Deposits to Total Assets



Source: Banking Regulation and Supervision Agency, http://www.bddk.org.tr/BultenAylik/en/Home/Gelismis [Accessed: 8th August 2022]

4. FACTORS AFFECTING THE MATURITY OF DEPOSITS

Banking Law No. 5411 defines the deposits as 'money accepted by announcing to the public, verbally or in writing or any manner, in return for or without a consideration or to be returned on a certain date of maturity or whenever it is called'. According to the Communique about Types and Maturities of Deposit and Participation Accounts (Banking Regulation and Supervision Agency, 2005) deposits can be classified as demand deposits and time deposits. Time deposits can also be subclassified as (a) maturity of up to 1 month, (b) maturity between 1-3 months, (c) maturity between 3-6 months, (d) maturity between 6-12 months, and (e) maturity 1 year and the longer maturity.

Turkey is suffering from the short maturity of deposits since 2001 crisis. With the maturity of deposits remaining very short, banks continue to have a significant maturity mismatch, to a large extent in foreign currency. The banking system did not experience deposit flight during the crisis; in fact, foreign currency deposits flight continued to increase in 2001. The maturity of deposits, however, has not lengthened significantly despite the resolution of crisis. The average maturity is still very short both Turkish lira and foreign currency deposit. The comparatively longer maturity of the banking sector's assets creates a substantial maturity mismatch on bank balance sheet (Keller & Lane, 2005, 25)

Graph 2. Weighted Average Nominal Maturity of Total Deposits

Source: Banking Regulation and Supervision Agency,
http://www.bddk.org.tr/BultenAylik/en/Home/Gelismis
[Accessed: 8th August 2022]

Graph 2 presents the weighted average nominal maturity of total deposits between January 2012 and January 2021 period. Graph 2 can be interpreted by dividing it into 3 sub-periods. In the sub-period of January 2012-December 2018, the maturity of deposits reflects modest waving between 50-60 days. In the sub-period of January 2019-December 2019, the average maturity of deposits plunged to 36-day maturity. This slope of the average maturity of

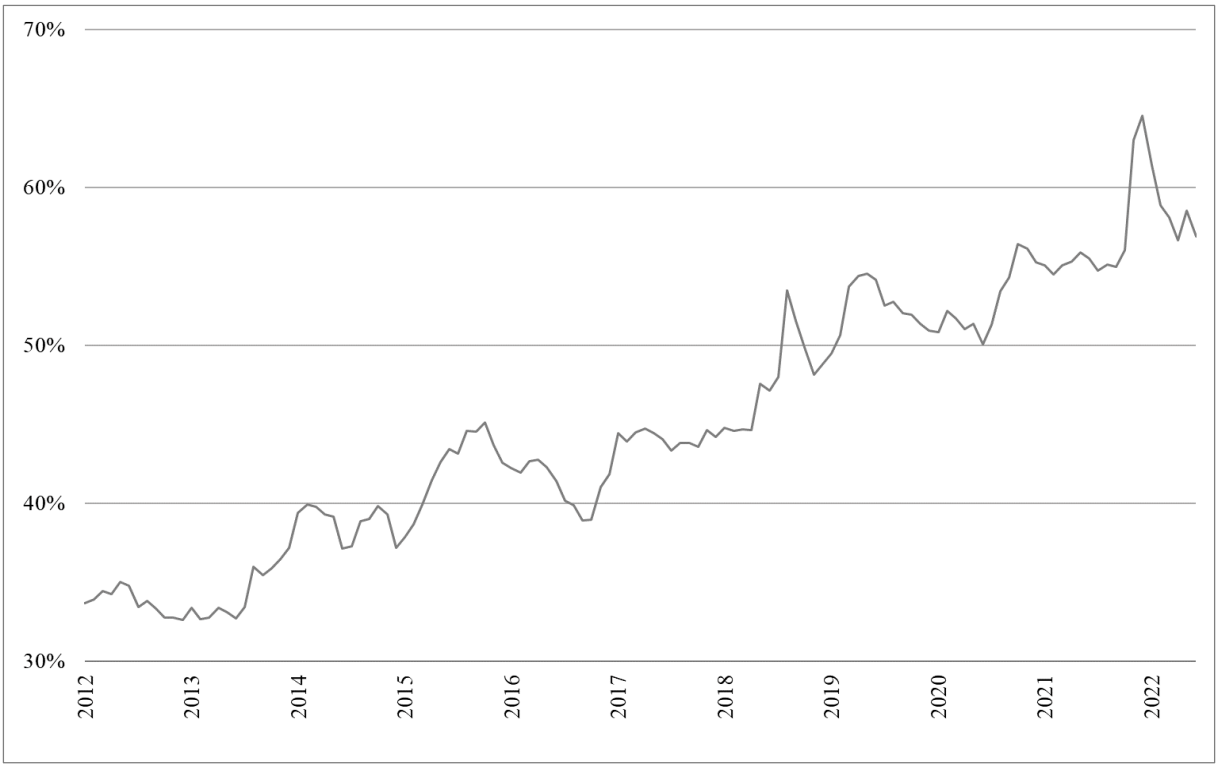
deposits is driven by the significant worsening financial stability. Shortening maturity causes the shrinking of the credit market and the increase in dollarisation of deposits. Since January 2022, the average maturity of deposits began to rise because of currency protected deposit policy.

The shortening maturity of deposits may lead the commercial banks to international borrowings, mostly in the long-term and totally in foreign currency. foreign currency loan means the possibility of exposing the foreign currency risk. Banks have two alternatives, (1) banks can carry foreign currency risk by hedging with the excessive cost and (2) to transfer the foreign currency risk to credit clients. The latter leads to excessive credit exposure in the credit portfolio.

4.1. Dollarisation of Deposits

Deposit dollarization is defined in this paper as the share of foreign currency deposits in total domestic deposits in the banking system (Mwase & Kumah, 2015, 3). Technically, in financially stable periods, the domestic currency is preferable, due to low inflation levels and confidence. But in financially unstable periods, the US Dollar and/or other powerful foreign currencies like Euro, GB Pound, and Swiss Franc are the most preferable ones to preserve the purchasing power and to halt the meltdown of wealth and capital. The more dollarisation, the shorter maturity of deposits, this is because of that depositor seeks the advantage of foreign currency returns in in place of domestic currency.

Graph 3. Percentage of Foreign currency Deposits



Source: Banking Regulation and Supervision Agency,
http://www.bddk.org.tr/BultenAylik/en/Home/Gelismis
[Accessed: 8t^{h} August 2022]

As seen in Table 1; 43,1% of total deposits are demand deposits and 29,4% of total deposits in foreign currency time deposits. From another point of view, 62,5% of total deposits are 'non-sensitive to maturity' and only 27,5% of total deposits shapes the term structure of total deposits. Graph 3 presents the trend of foreign currency deposits in total deposits between January 2012 and June 2022. The portion of foreign currency deposits in total deposits are steadily waving up since the beginning of the period. This was driven by response to inflation and foreign currency spiral or weakening depositors' confidence. Two other reasons for dollarisation are the high volatility of net interest returns for domestic currency deposits and the negative return of domestic currency deposits.

4.2 Net Interest Return for Domestic Currency Deposits

Graph 4 presents the fluctuations of net interest returns for domestic currency deposits. Graph 4 can be interpreted by dividing it into 4 sub-periods. In the sub-period of 2012-May 2018, banks offered nearly zero net return for domestic currency deposit maturity of deposits.

In the sub-period of May 2018-September 2019 and the sub-period of September 2019-January 2021, financial confusion is obvious; respectively a sharp decrease, increase, and then decrease in interest rates. Since January 2020, the net interest returns for domestic currency deposits drastically meltdown amid interest-free economic disputes. Banks have begun to offer lower interest rates for time deposits; thus, the net return also was weakened significantly due to tightening financial conditions.

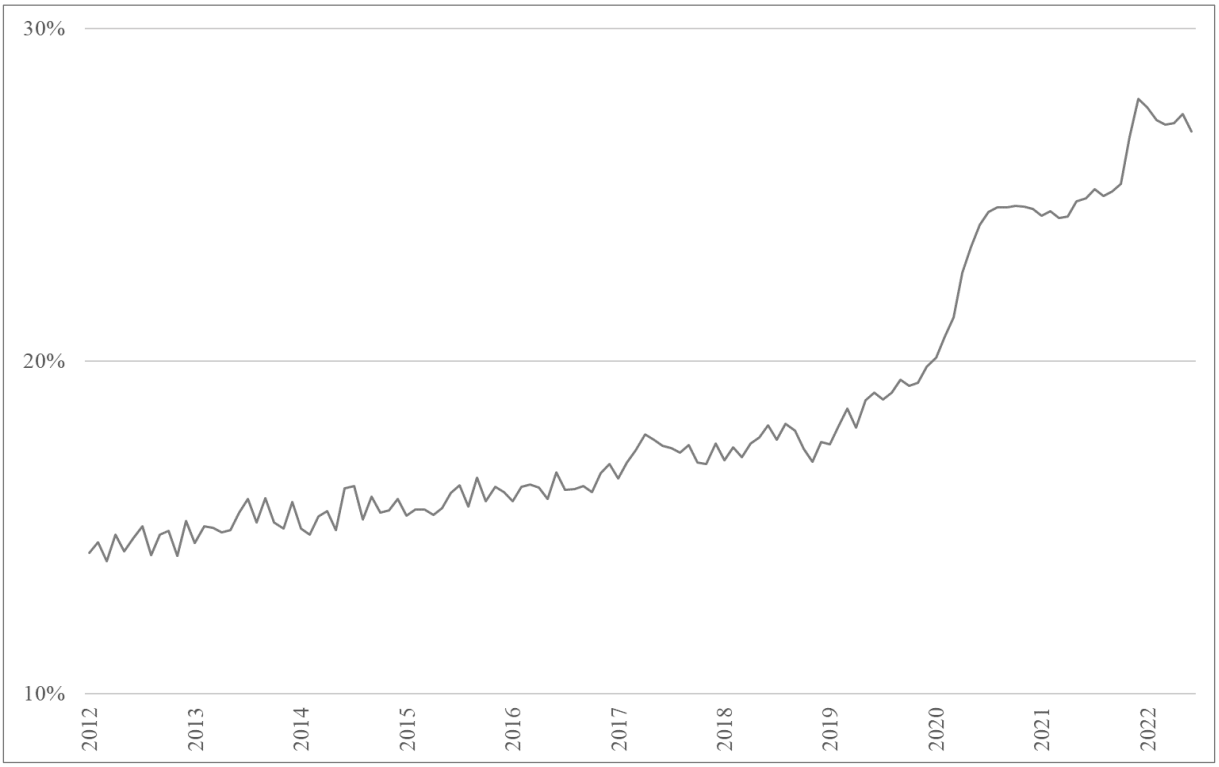
Graph 4. Net Interest Returns for Domestic Currency Deposits

Source: Turkish Statistical Institute, https://data.tuik.gov.tr/Bulten/Index?p=Finansal-Yatirim-Araclarinin-Reel-Getiri-Oranlari-Haziran-2022-45574 [Accessed: 8th August 2022]

4.3 Share of Non-Maturity Deposits in Total Deposits

Graph 5 can be interpreted by dividing it into two sub-periods. In the sub-period of January 2012-2019, the maturity of deposits reflects a slight increase. After January 2019, sudden hike in demand deposits compared to time deposits. In this period, depositors preferred non-maturity deposits rather than contractual maturity. The current upward trend reflects the tightening of financial conditions and worsening stability.

Graph 5. Non-Maturity Deposits in Total Deposits



Source: Banking Regulation and Supervision Agency

http://www.bddk.org.tr/BultenAylik/en/Home/Gelismis

[Accessed: 8th August 2022]

4.4. Reserve Requirement Mechanism

Reserve Requirement (RR) must be held in the form of a reliable asset: historically, in gold, but now typically in central bank money. Central bank (or 'reserve' or 'base') money refers to domestic-currency central bank money used in an economy and is defined as currency in issue plus commercial bank balances held at the central bank (Gray, 2011, 6). A central bank may apply less commission rate of RR for the longer-term deposits to help to lengthen the average maturity of deposits. RR is set for fixed maturity brackets like up to 1 month, between 1-3 months, etc. But depositors and banks find easily a 'back door' on a specific date of 34-day or 34-day deposit maturity for gaining the advantage of shorter maturity of 1 month and lesser RR of 1-3 months period. Graph 6 presents the total deposit volume compared to reserve requirements.

Graph 6 can be interpreted by dividing it into 3 sub-periods. Graph 6 shows that in the sub-period of January 2012-September 2015, The Central Bank of the Republic of Turkey

(CBRT) applied RR policy for ‘inflation concerns’ to speed down the credits, and then in the sub-period of October 2015-September 2018, CBRT changed RR policy for ‘inflation concerns’ in the opposite direction to speed up the credits. Since September 2018, a significant hike in RR can be seen in Graph 6 CBRT changed RR policy markedly for ‘liquidity concerns’ to increase its gross foreign currency reserves.

Graph 6. Reserve Requirements to Deposits

Source: Banking Regulation and Supervision Agency

http://www.bddk.org.tr/BultenAylik/en/Home/Gelismis

[Accessed: 8th August 2022]

5. NOMINAL MATURITY vs. EFFECTIVE MATURITY

We use the familiar term ‘demand deposits’ to mean the more broadly defined ``non-maturity deposits" (Jarrow & van Deventer, 1998, 250). Deposits are a major source of funding for financial institutions. A substantial part of it consists of non-maturity deposits. banks (Laurent, 2004, 2)

The demand deposits are some money held by a depositor at a bank with the right of withdrawing at any time. Demand deposit has no contractual maturity.

5.1.1. Nominal Maturity of Demand Deposits

The nominal maturity of demand deposit is assumed as 1-day. The weighted average nominal maturity of all demand deposits is assumed as 1-day.

5.1.2. Effective Maturity of Demand Deposits

The effective maturity of demand deposit can be calculated simply as follows.

$$ed_{dd} = pt - nm_{dd}$$

ed_{dd} : Effective maturity of a demand deposit

pt : Present time

nm_{dd} : Opening date of a demand deposit

The weighted average effective maturity of all demand deposits can be calculated as follows.

$$\sum ed_{dd} = \frac{(ed_{1.dd} \times v_{1.dd}) + \cdots + (ed_{n.dd} \times v_{n.dd})}{v_{1.dd} + \cdots + v_{n.dd}}$$

Sed_{dd} : Weighted average effective maturity of all demand deposits

ed_{dd} : Effective maturity of a demand deposit

v_{dd} : Volume of a demand deposit

5.2. Time Deposits

The time deposits are some money held by a depositor at a bank with the right of withdrawing for the contractual maturity date. The time deposit is an interest-bearing bank account for a specified maturity. Time deposit has contractual maturity. Time deposits have contractual maturity dates that heavily influence banks' cash flows and repricing characteristics (Mishkin, 2011, 316).

5.2.1. Nominal Maturity of Time Deposits

The nominal maturity can be defined as the contractual maturity agreed between a bank and a depositor. Nominal maturity of time deposit is the contractual date, i.e., 1-month, 3-month, etc. The weighted average nominal maturity of all time deposits can be calculated as follows.

$$\sum nm_{td} = \frac{(nm_{1.td} \times v_{1.td}) + \cdots + (nm_{n.td} \times v_{n.td})}{v_{1.td} + \cdots + v_{n.td}}$$

Snm_{td} : Weighted average nominal maturity of all time deposits

nm_{td} : Nominal maturity of a time deposit

v_{td} : Volume of a time deposit

5.2.2. Effective Maturity of Time Deposits

The effective maturity of deposits is critical for maturity deposit assumptions.

The effective maturity of the time deposit can be calculated as follows.

$$ed_{td} = pt - nm_{td}$$

ed_{td} : Effective maturity of a time deposit

nm_{td} : Opening date of a time deposit

pt : Present time

The weighted average effective maturity of all time deposits can be calculated as follows.

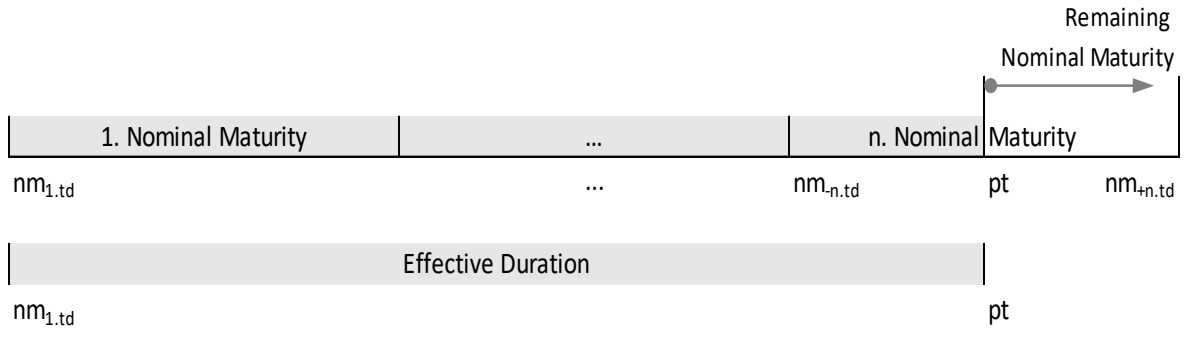
$$\sum ed_{td} = \frac{(ed_{1.td} \times v_{1.td}) + \cdots + (ed_{n.td} \times v_{n.td})}{v_{1.td} + \cdots + v_{n.td}}$$

Sed_{td} : Weighted average effective maturity of all time deposits

ed_{td} : Effective maturity of a time deposit

v_{td} : Volume of a time deposit

Figure 1. Effective maturity of Time Deposit



$nm_{1.td}$: Opening date of 1. nominal maturity of a time deposit

$nm_{-n.td}$: Opening date of n. nominal maturity of a time deposit

pt : Present time

$nm_{+n.td}$: Closing date of n. nominal maturity of a time deposit

5.3 Rate of Effective Maturity/Nominal Maturity

5.3.1 Demand Deposits

This rate is the calculation of the roll-over rate of demand deposits. The rate is equal to the effective maturity for demand deposits because nominal maturity is 1-day.

$$R_{dd} = \frac{ed_{dd}}{nm_{dd}} = \frac{ed_{dd}}{1} = ed_{dd}$$

R_{dd} : Rate of effective maturity/nominal maturity of demand deposit

ed_{dd} : Effective maturity of a demand deposit

nm_{dd} : Nominal maturity of a demand deposit

The effective maturity/nominal maturity rate of all demand deposits can be calculated as follows.

$$\sum R_{dd} = \frac{(R_{1.dd} \times v_{1.dd}) + \cdots + (R_{n.dd} \times v_{n.dd})}{v_{1.dd} + \cdots + v_{n.dd}}$$

SR_{dd} : Rate of effective maturity/nominal maturity of all demand deposits

R_{dd} : Rate of effective maturity/nominal maturity of a demand deposit

v_{dd} : Volume of a demand deposit

5.3.2. Time Deposits

This rate is the calculation of the roll-over rate of time deposits. For time deposits, the rate is equal to effective maturity divided by nominal maturity.

$$R_{td} = \frac{ed_{td}}{nm_{td}}$$

R_{td} : Rate of effective maturity/nominal maturity of time deposit

ed_{td} : Effective maturity of a time deposit

nm_{td} : Nominal maturity of a time deposit

The effective maturity/nominal maturity rate of all time deposits can be calculated as follows.

$$\sum R_{td} = \frac{(R_{1.td} \times v_{1.td}) + \cdots + (R_{n.td} \times v_{n.td})}{v_{1.td} + \cdots + v_{n.td}}$$

SR_{td} : Rate of effective maturity/nominal maturity of all demand deposits

R_{td} : Rate of effective maturity/nominal maturity of a time deposit

v_{td} : Volume of a time deposit

5.4 Pricing Model for Deposits

This approach assumes that the time deposits technically have 'uncertain maturity', ranging from nominal maturity to effective maturity. Depositors have a right (a put option) to roll over deposits at every nominal maturity throughout the effective maturity. In this calculation, Black-Scholes Option Pricing Model (Black & Scholes, 1973) could be used to value this put option.

$$P_0^{\%} = \frac{\emptyset(NP)\left[R_X\left(1 - N(d_2)\right) - R\left(1 - N(d_1)\right)\right]e^{-R_f T}}{NP}$$

$$d_1 = \frac{\ln\left(\frac{R}{R_x}\right) + \left(R_f + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

Source: (Black & Scholes, 1973)

σ Estimated annualized standard deviation of logarithmic return of time deposits

R Bank's interest rate for time deposits

R_x Market's interest rate for time deposit

R_f Continuously compounded annual risk-free rate

T Effective maturity of time deposits

$\emptyset$ Remaining time to expiration of nominal maturity of time deposits

NP Current amount of time deposits

$N(d)$ Cumulative normal probability

6. CONCLUSION

We figured out that the term structure of deposits has two dimensions; nominal maturity (contractual maturity) and effective maturity. Theoretically, we conclude that a deposit has an 'indefinite' maturity with an embedded option to extend throughout its effective maturity. This embedded option refers to the right of a depositor to withdraw or not its deposit at contractual maturity. We claim that there are lots of factors shaping the effective maturity of deposits. The

main factors in the Turkish banking system are the dollarisation of deposits, the net interest return for domestic currency deposits, the share of non-maturity deposits in total deposits and the reserve requirement mechanism.

We emphasize that the effective maturity must be taken into consideration in the analysis of the term structure of deposits, not only in the maturity perspective but also in the pricing of deposits. Considering the equilibrium between the repricing of existing deposit accounts and the cost of gaining new deposit accounts, by differentiated effective deposit pricing strategy, deposits could be repriced at the nominal maturity respecting the effective maturity. Put option pricing models can be a solution to reprice a deposit account to extend its effective maturity. The longer the effective maturity of a deposit account, the more the interest on a deposit account is most likely.

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