Fair Value and Interest Rate Risk of Demand Deposits

*Petr STRNAD**

Abstract

Demand deposits play an important role for commercial banks as they represent relatively reliable funding base as well as a source of income (they are remunerated bellow market rates, sometimes even at zero rates). At the same time, demand deposits are also responsible for significant part of volatility of profit and loss (P&L) – both economic and accounting. This paper demonstrates how the interest rate risk of demand deposits may be assessed and hedged under earnings perspective and economic value perspective and discusses whether these approaches are consistent with low volatility of accounting P&L.

Keywords: *demand deposits, interest rate risk, replicating portfolio models, stochastic models, hedge accounting*

JEL classification: G11, G12, G13, G21, G32

Preface

Demand deposits play an important role for commercial banks. In spite that they can be withdrawn by clients at any time, statistical analyses show that their volumes remain rather stable. Demand deposits thus create reliable funding base for middle to long-term assets. As they are remunerated bellow market rates[1] (sometimes even at zero rates), they constitute very important source of income for banks (generally even after the deduction of related costs).

The role of demand deposits as income driver is strong also because of its material volumes. Sheehan (2004) shows that in U.S., they represented at the end of 2003 about 45% of both commercial banks' and thrifts' total liabilities. In

* Petr STRNAD, Modrá pyramida stavební spořitelna, a. s., Bělehradská 128/222, 120 21 Praha 2, Česká republika; e-mail: petr.strnad@mpss.cz

[1]The low interest paid on demand deposits may be seen as a consequence of regulatory barriers to entry, leading to market concentration or it can be argued that clients simply prefer high liquidity and additional services, instead of being too much concerned by opportunity costs (at least unless they overstep some threshold).

Czech Republic the situation is similar – see the table bellow (figures are in mill. CZK, non-consolidated data[2] are taken from annual reports from 2006 – see Česká spořitelna, 2007; Československá obchodní banka, 2007; Komerční banka, 2007).

T a b l e 1

Share of Demand Deposits on Total Volume of Liabilities in Czech Banks

	Komerční banka	Česká spořitelna	Československá obchodní banka
Demand deposit	250 934	326 032	255 746
Total liabilities	512 250	585 163	613 177
Share (in %)	48.99	55.72	41.71

Source: Annual Reports of Czech Banks (2007).

Share of demand deposits on net interest income (NII) of banks is hard to assess as Czech banks usually don't report its composition of NII. From above-mentioned banks, only Komerční banka (KB) reported it – deposits create more than 57% of its NII. Based on the share of demand deposits on total deposits and the fact that demand deposits generate higher interest rate margin than other type of deposits, we estimate that demand deposits generate over 40% of NII.

Not only that demand deposits represent an important income driver, they are also responsible for significant portion of volatility of bank's earnings. Kuritzkes and Schuermann (2007) show that structural interest rate risk of U.S. banks accounts for 18% of its total earnings volatility, compared to market risk, which is much more intensively studied by academics in spite that it accounts only for 5% of earnings volatility. Banks are traditionally focused on the stability of earnings, because reduced earnings or even losses can threaten the financial stability of an institution by undermining its capital adequacy and by reducing market confidence.

Demand deposits represent a prominent source of structural interest rate risk both due to its high volumes and complicated option-like behaviour (clients may deposit or withdraw their money at any time without penalty and banks are allowed to change the interest rate). Without options, it would be relatively easy for banks to hedge the structural interest rate risk by matching the duration of its assets and liabilities (through active management of product parameters or through hedging with balance sheet instruments or interest rate derivatives). Existence of complex embedded options, whose payoff depends both on market interest rates and other influences (e.g. behaviour of clients and competitors),

[2] Share of demand deposits in consolidated balance sheets is on average by 9% lower, reaching approximately 40%.

is the key factor, which makes management of structural interest rates so complicated.

Banks seriously study the behaviour of demand deposits rates and volumes under different scenarios. The aim is to propose such an investment strategy, which would both ensure high and stable interest rate margin through time and allow for timely payments, if clients wish to withdraw their money more quickly than expected in the baseline scenario.

Even if above-mentioned earnings perspective is recognized by Basel Committee on Banking Supervision (2004) as a valid perspective for assessing a bank's interest rate risk exposure, it doesn't generally attract much attention of academic studies regarding demand deposits. Academics focus instead on another complementary perspective for assessing interest rate risk, which is the economic value perspective (for definition, see again Basel Committee on Banking Supervision, 2004). So they aim to construct models for calculation of fair value of demand deposits and assess its sensitivity to changes of interest rates. The target of interest rate risk management in this perspective is to offset the sensitivity of economic value (fair value) of demand deposits to market rate movements by concluding hedging transactions. In other words, the economic value perspective is focused primarily on stability of economic profit and loss (P&L), whereas earnings perspective aims to achieve stable accounting P&L.

In this paper, I would like to review the existing literature focused on fair value and interest rate risk of demand deposits, as well as present my own remarks and opinion on this highly controversial theme. The rest of the paper is structured as follows:

In the first section, I describe demand deposits from earnings perspective, I introduce the notion of replicating portfolio models (RPMs) and I explain how it is used in banks.

The second section focuses on economic value perspective; I review the existing literature and I show how a model for valuation of demand deposits is built. I stress that models for valuation of demand deposits are more complex than models for valuation of interest rate derivatives as they aim to describe the joint behaviour of banks, who set the interest rates paid on demand deposits, and clients, who decide to withdraw or deposit money to their accounts; in addition to the dynamics of market interest rates.

The third section presents the accounting treatment of demand deposits and discusses whether usage of derivatives or other instruments for hedging of earnings or economic value of demand deposits may be consistent with stability of accounting P&L.

The fourth section provides a short conclusion.

1. Stabilization of Net Interest Margin (Earnings Perspective)

1.1. Replicating Portfolio Models (RPMs)

Large internationally active banks typically apply so-called RPMs for the management of demand deposits. Replicating portfolio models are characterized by fixed weights assigned to different maturities. The stable part of demand deposits is then (mostly) linearly replicated to selected maturities according to prespecified weights. The unstable (volatile) part is invested on short term. Alternatively the stable part may be further divided into interest-rate insensitive core deposits, which are invested at the longest "reasonable" investment horizon and remaining balances, which are further replicated (see Maes and Timmermans, 2005, for a case study of Belgian savings deposits).

For example, if the stable part of demand deposits has volume of 1 200 and 50% is linearly replicated up to 2 years and 50% up to 10 years, the portfolio replicating interest rate risk of demand deposits may be described in a following way: The portfolio consists only of bonds; fixed rate bonds with volume of 30 mature in each of the first 24 months and fixed rate bonds with volume of 5 mature in each of the following 96 months.

If the stable part of demand deposits doesn't change through time and changes of interest rates paid on demand deposits are in line with expectations, maturing investments are simply replaced each month with new investments of the predefined maturity (25 is placed into 2 year fixed rate bonds, 5 is placed into 10 year fixed rate bonds) – so that the structure of the portfolio remains the same.

If the stable part of demand deposits increases or decreases, investments (divestments) are made to maintain the same proportions of fixed rate bonds maturing (re-pricing) in each from the future time buckets. Generally divestments are not expected to be very frequent. If they are observed rather often or in a significant extent, the assumptions of the model must be carefully reviewed – it may be a sign that the stable part is not as stable as originally expected. Diminishing of demand deposits may be induced for example by significant decrease of market share or by erosion of traditional retail deposit bases because of product innovation and competition for financial assets (as it has happened in the USA or in Australia).

During the periodical reviews of RPMs, not only the stability of volumes is tested. Also the behaviour of interest rates paid on demand deposits must be checked, in order to confirm that it still shows the dependency on the evolution of market interest rates as assumed by the model.

1.2. Choosing Weights and Maturities in RPMs

Weights and maturities in replicating portfolio models are chosen in an optimization process to meet the predefined target – typically to achieve stable interest rate margin (difference between the return of replicated portfolio and demand deposit rates) and to ensure that the volumes of replicating portfolio follow dynamics of demand deposit balances. Alternatively there could be different targets, e.g. stability of interest rate margin could be partially sacrificed, in order to achieve higher margin (in a statistical sense).

The optimization is based mostly on historical data; however it is necessary to take also into account other factors; like the overall business model of the enterprise, the expected changes in the client's behaviour as well as the behaviour of competition. In some cases, history doesn't need to be a good predictor for the future, therefore careful approach should be chosen.

Following two examples outline, how weights and maturities in a simple RPM may be chosen and what are the implications:

- For example, if the rates paid on demand deposits are expected to remain stable, the stable part of demand deposits is replicated into long-term maturities (e.g. 10 years). In this case, interest rate margin corresponds to the difference of 10 years moving average of 10 years market rates and demand deposits rates (assumed to be fixed).
- On the contrary, if demand deposits rates are expected to vary to some extent with market interest rates, the corresponding proportion of demand deposits is replicated into short-term maturities. The shorter maturity is used, the faster adjustment to the change of market rates is expected.

If there is a strong or even non-linear dependency of the volume of demand deposits on the level of market interest rates, it represents a problem and it should be taken into account when calculating the stable part of demand deposits.

It must be stressed that only stability of interest margin on replicated portfolio (i.e. on the stable part of demand deposits) is usually targeted. So the total interest rate margin on demand deposits is less stable due to the existence of the volatile part. If market interest rates fall, the unstable part of demand deposits usually raise, as opportunity costs of investing into demand deposits are low. New demand deposits are invested at low rates, which pushes down the total interest margin (in percentage terms). However increase of unstable part of demand deposits may partly represent only a transfer from other deposits with lower interest margin (e.g. term deposits), so the total net interest margin on liabilities doesn't need to fall.[3]

The replicating portfolio may consist from bonds or from short term assets (e.g. money market lending), whose duration is prolonged via receive fix interest

rate swaps (IRSs). The later alternative is especially beneficial, when the entity isn't liquidity. On the other hand, hedging via IRSs needs to be complemented by usage of hedge accounting to ensure that profit or loss from the hedged and hedging item impact income statement in the same period. The application of hedge accounting is demanding in terms of time and qualified employees.

Dewachter, Lyrio and Maes (2006) compare duration of Belgian savings deposits estimated by their discounted cash flow model (see the next section) and duration estimated by RPM, under the assumption that deposit balances will stay constant in the future. The RPM, which aims at minimization of standard deviation of net interest margin, delivers very similar estimation to the discounted cash flow model, RPM focusing at maximization of Sharpe ratio leads to significantly higher duration estimates.

Frauendorfer and Schürle (2003) compare performance of RPMs with their own model, which looks for an optimal investment strategy (i.e. with the highest interest rate margin). In contrary to RPMs, model of Frauendorfer and Schürle is dynamic – it doesn't require keeping predefined proportions of investments, maturing in each time bucket. Investment decisions at each time point are based instead on simulation of joint evolution of future market interest rates and demand deposit's volumes. Their model leads to interest rate margin higher by 25 bps. compared to the case when the better of the two considered RPMs is applied. On top of that their interest rate margin is also significantly more stable in time.

Model of Frauendorfer and Schürle is sometimes referred to as a "dynamic RPM" as it tries to tackle an important shortcoming of the above-described "static RPMs", namely that the optimization is done only once, using just historical data. On the contrary, dynamic RPMs try to model the joint future evolution of market rates as well as demand deposit rates and balances. Optimal investment strategy is derived based on those scenarios.

2. Demand Deposits from Economic Value Perspective

2.1. Calculating Fair Value

For instruments, which are traded on an active market, economic value (fair value) can be obtained directly from the market. This is generally not the case of demand deposits, so a model for its valuation must be developed. As there have

[3] Periods of low interest rates often push on the decrease of interest margin on liabilities side as client rates are limited by 0% floor. Such negative P&L drivers may be compensated e.g. by increase of interest margin on asset side, by higher volume of client transactions or by collecting higher fees and commissions.

been quite a lot prices of demand deposits observed in the past in bank or branch sales (see e.g. Berkovec, Mingo and Zhang, 1997; or also Jarrow and van Deventer, 1998), model can be calibrated to match these prices (if they are still considered relevant for today's market conditions).

The model for valuation of demand deposits may be built in a similar way as a model for valuation of complex interest rate derivatives – as a first step, suitable stochastic process describing future evolution of interest rates must be chosen and calibrated to the market (to match the term structure of interest rates and volatilities quoted in the market).

In the case of demand deposits, the modelling is more complicated than for complex interest rate derivatives, as the payoffs don't depend only on the evolution of market interest rates, but also on the joint behaviour of banks and clients, who interact. Banks set the interest rates paid on demand deposits having in mind that their decision influences behaviour of clients, who decide to withdraw or deposit money to their accounts. The dependency of demand deposit volumes and rates on market rates must be estimated. This is the most complicated task in the valuation of demand deposits (however this applies also for RPMs). This dependency is usually assessed from the past client's behaviour; however with following constraints:

- Past data don't need to be sufficient to assess accurately the dependency of demand deposit rates and volumes on market rates. If e.g. in the past the market rates have been relatively low, the difference between return from demand deposits and alternative investments wasn't big, so the sensitivity of demand deposit volumes to market rate movements wasn't very significant. However, if market rates rise strongly in the future, the difference between rates may increase significantly (demand deposits rates often don't tend to increase as fast as market rates). So in the environment of high interest rates, there could be much stronger outflow from demand deposits than predicted from history of relatively low interest rates.
- The future behaviour of clients and competing banks doesn't need to be the same as it was observed in the past (especially for the distant future); e.g. new aggressive bank may come in the market offering very competitive rates on demand deposits to attract new clients. Other banks may keep their pricing strategies or follow the new-coming bank. As the technology evolves, it is much easier for clients to transfer funds quickly and cheaply from their homes, so they may react much faster if difference between return from demand deposits and other investments widens.
- Advances in technology also imply lower servicing costs, which may push interest rates paid on demand deposits closer to market rates.

After the dependency of demand deposit rates and volumes on market interest rates is estimated, fair value of demand deposits is simply obtained as the (weighted) average from discounted payoffs from demand deposits under different scenarios of evolution of market interest rates. Corresponding servicing costs, incl. insurance paid into deposit insurance fund, needs to be calculated among payoffs.

Jarrow and van Deventer (1996) advocate a „market segmentation" hypothesis to justify that rates paid on demand deposits are lower then market interest rates of comparable (equal risk) investments. They stress that when both demand deposit volumes and interest rates depend linearly on short-term market rates, the valuation of demand deposits corresponds to the valuation of exotic power swaps, which can also be used for its hedging. In the paper mentioned, authors apply Health Jarrow Morton model (HJM) model for evolution of interest rates. In the other paper (see Jarrow and van Deventer, 1998), Jarrow and van Deventer present their ideas in a deeper detail. They also derive closed form solution in a more complex case, when demand deposit volumes and rates adjust according to the current market interest rates, changes in market interest rates and a time trend; evolution of market interest rates follows HJM process. The coefficients describing the dependencies of demand deposits rates and volumes on market rates may be estimated with the usage of regression analysis.

Janosi, Jarrow and Zullo (1999) use again HJM model to describe dynamics of market interest rates. When modelling the evolution of demand deposit balances, they simulate separately diminishing of existing balances and growth of new balances. In both cases, they assume an exponential relationship with following parameters – constant retention rate raised to the t-th power (t represents time) drives the decrease, whereas increase depends on constant growth rate (multiplied by time) as well as on weighted average of past spot interest rates. Demand deposit rates depend on the weighted average of past market interest rates, if we neglect this contribution, they revert from initial levels to floor rate k. Under these assumptions, authors derive closed form solution for valuation of demand deposits. In comparison to previous models Janosi, Jarrow and Zullo precisely capture the delayed adjustment of demand deposit rates and volumes after the change of market interest rate.

Frachot (2001) only studies demand deposit volumes. He assumes that each customer have a subjective strike. When market rates are above the strike, account balance converges progressively to the customer-specific target level b representing the minimum level of liquid funds needed for transactional and other purposes. On the contrary, when market rates stay below the strike, account balance grows progressively as the customer doesn't redirect funds into

the other more profitable investments. The overall volume of demand deposits balances is obtained by aggregating over the whole population of customers; suitable probability distribution of subjective strikes must be chosen and calibrated. Attrition is modelled as a separate process, unrelated to market interest rate movements.

O'Brien (2000) stresses that deposit rates exhibit stickiness – they adjust only slowly to their equilibrium rate, which is assumed to depend linearly on prevailing short-term market rates. In addition, he shows that rate adjustments tend to be asymmetric – displaying rigidity when market interest rates are increasing and relative flexibility when market rates are decreasing. Maes and Timmermans (2005) find similar conclusions for Belgian savings deposits.

O'Brien either assumes fixed volumes of demand deposits or he models the evolution of balances in dependency on opportunity costs (difference between demand deposit and market rates) and growth of GDP (assumed to be deterministic – 3% annually). Cox, Ingersoll, Ross (CIR) model is used to describe the future evolution of short-term market rates.

Sheehan (2004) criticizes that standard methods of valuing core deposits use treasury rates for discounting. He emphasizes that opportunity cost of funds should represent the relevant discount rate especially in institutions, which have excess of client loans and are looking for additional funding. In this case, using treasury rates in the fund transfer pricing doesn't generate sufficient incentive for raising additional demand deposits. As the choice of interest rate from the above-described perspective of fund transfer pricing is highly bank specific[4] and doesn't play role in the case of bank sales, I would rather stick (for the valuation purposes) to treasury rates – at least when comparing figures between banks.[5] It is often argued that demand deposits have comparable default risk to government bonds, which supports the usage of treasury rates for discounting. Strictly speaking, this argument is only true, if the deposit insurance fund fully guarantees all demand deposits.

When modelling future volumes of demand deposits, Sheehan carefully distinguishes volumes on existing accounts and on new accounts. Not including "new business"[6] naturally leads to lower (conservative) estimates of fair value of

[4] It matters whether bank is liquidity rich or not, at which prices it places (funds) their excess (lack) of liquidity or even how it allocates hedging costs, etc.

[5] By the way, International Financial Reporting Standards (IFRSs) (see International Accounting Standards Board, 2006) define fair value as the price that would be obtained in an arms' length transaction between willing buyers and sellers; this definition also doesn't allow for any entity-specific value that differs from the amount that other entities can realize.

[6] What is exactly considered "new business" in the case of demand deposits is an issue full of controversy. Practitioners usually understand new business as balances on newly opened accounts,

demand deposits, such estimates may be interesting e.g. for regulators when assessing institution's value in the face of liquidation.

Dewachter, Lyrio and Maes (2006) study fair value and interest rate risk of Belgian savings deposits. They employ three factor affine term structure model, which achieves superior fit of actual yield curve than single factor yield curve models used in above-mentioned studies. In their paper, they investigate the dependency of deposit rates of 8 Belgian banks on both market rates and a so-called "deposit spread factor", representing spread between short market rate and deposit rate set by a chosen big Belgian bank.

However it must be stressed that despite the three factor model achieves superior fit of yield curve, it is not significantly more successful in explaining the total deposit rate variability than single factor models. Regarding development of deposit balances, Dewachter et al. assume that interest stays on savings deposits (leading to the increase of balances) and decreases are driven by expertly assessed decay rates (in the range from 10% to 50%). Also constant balances are investigated and range of constant servicing costs is studied. Deposit premium is found to be statistically significant, it increases when market rates rise, however it is much less variable when comparing between Belgian banks than it has been found in comparisons between US banks (see e.g. O'Brien, 2000; or Hutchison and Pennacchi, 1996). Deposit premium vary to large extent depending on the assumed servicing costs and decay rates. Sensitivity of deposit premium to interest rates movements is not very stable – in fact just sensitivity to parallel movements of yield curve[7] shows reasonable stability not only for different servicing costs, but also for decay rates. However this stability weakens, when factors start from different vectors randomly drawn from the multivariate normal distribution.

US Office of Thrift Supervision (OTS) (see Office of Thrift Supervision, 2001) has developed its own model for valuation of demand deposits; institutions under its supervision are required to use it. The model is based on two basic equations – one specifies future development of demand deposits rates and it uses only parameters estimated by OTS, the other estimates the evolution of demand deposit volumes and it uses partly institution specific retention rates (mainly for the near future) and partly retention rates assessed by OTS. The OTS model does not include new deposit balances, but models the gradual decline of the initial deposit. Cost rates are also estimated by OTS from data from all thrifts and applied to all thrifts.

---

on the contrary accounting standard setters are mostly more conservative and they tend to interpret each cash-in to a single account as new business, as discussed bellow.

[7] It may be interpreted as a proxy for duration.

Cash flows obtained under pre-specified interest rate scenarios[8] are discounted using money market rates plus spread defined by OTS. Spread is applied to calibrate fair values of demand deposit to observed prices for deposit purchases. No stochastic model is used for the description of interest rates evolution. The OTS approach leads to a great comparability between banks; on the other hand it assumes that demand deposits in all institution behave in a similar way, which has been rather refused by empirical studies.

From methodological point of view, OTS model belongs to a wider class of models, which are sometimes referred to as present value methods or static discounted cash flow methods. Other representative of such models is for example model of De Jong and Wielhouwer (2001). Such models don't aim to describe the dynamics of interest rates; they just discount the estimated cash flows under one or a few interest rate scenarios. These models are conceptually easier than dynamic discounted cash flow methods described earlier. Dynamic discounted cash flow models mostly use the risk-free rate for discounting, in this case, they are referred to as contingent claim methods or no arbitrage approach. Alternatively the discounted (and also static) cash flow methods may add spread to the risk-free rate used for discounting to calibrate fair value of demand deposits to prices observed in the realized bank or branch sales, those models are called option adjusted spread (OAS) models. Examples of these models are OTS model in the static class or the model of Selvaggio (1996) in the dynamic world (it uses CIR process to generate interest rate scenarios).

2.2. Hedging the Economic Value

In models described in the previous section, fair value of demand deposits depends on market rates in a complex, non-linear way, thus options are natural candidates for hedging. Also, delta hedging may be applied – sensitivity of fair value to movements of market interest rates needs to be estimated and the problem is (for hedging purposes) reduced back to the static discounted cash flow methods (dynamics of market interest rates doesn't need to be studied).

In both above-described cases, costs of hedging are usually higher than in the case of simple RPMs – either complex non-standard derivatives with high bid/ask spreads are used for hedging (if hedging directly via options) or hedging portfolio is frequently adjusted following market rates movements (if delta hedging is applied). Frequent rebalancing leads to higher transaction costs (assuming constant cost of transaction).

[8] Baseline scenario assumes that interest rates do not change (it is based on forward rates), other scenarios operate with ± 100, 200 and 300 basis points shift.

Adam, Houkari and Laurent (2006) use interest rate derivatives (mainly forward starting swaps and forward rate agreements – FRAs) to find hedging strategy, which leads to the lowest volatility of future (one-period) interest margin from demand deposits.[9] They assume that evolution of demand deposit volumes is partly correlated with interest rates (described by geometrical Brownian process) and partly driven by exogenous factor interpreted as "non-hedgeable" business risk. They also study the trade-off between risk and return (i.e. estimated mean vs. variance of future interest margin), assuming non-zero drift in the evolution of interest rates and different extent of risk aversion. They show that while the optimal strategy involves a continuous rebalancing, discrete updating of hedging portfolio with monthly or quarterly frequency only induces a small increase in the variance of interest margin. Finally, authors conclude that choice of hedging instruments doesn't have significant implications on the final risk, however usage of power options may lead to reduction of rebalancing frequency and to lower transaction costs.[10]

3. Accounting Treatment

Let's imagine that banks develop a model, which perfectly describes interest rate risk of demand deposits. Let's also assume that they find suitable instruments on the market and hedge the exposure for reasonable costs. When applying earnings perspective, plain vanilla interest rate swaps or bonds are sufficient for hedging, however when following economic value perspective, more complex derivatives must be used, unless delta hedging is applied.

In the above-described cases, banks succeeded to reach their "economic" targets, but all problems aren't eliminated. When using derivatives, volatility of accounting P&L may remain and even increase due to existing mixed attribute accounting model used by International Financial Reporting Standards (IFRSs) and US GAAP. Unless hedging relationship can be proven, both standards require measuring financial derivatives[11] at fair value through profit or loss, which contrasts with demand deposits measured at amortized cost. To overcome this inconsistency,[12] hedge accounting needs to be used to ensure that profit or loss

[9] This is an approach rather similar to economic perspective – hedging in fact targets stability of economic value, not the stability of interest margin in time.

[10] Of course, this conclusion will only be valid if liquid low-spread market for power options exists.

[11] Including embedded derivatives, whose economic characteristics and risks are not closely related to the economic characteristics and risks of the host contract – see International Accounting Standards Board (2006), IAS 39, Paragraph 11.

[12] And to reach the ultimate goal of earnings perspective, which is the stability of accounting P&L.

from the hedged item impact income statement in the same period as the P&L from the hedging item.

However fair value hedging of demand deposits can't be applied neither within "full IRFS" nor within US GAAP. On the contrary, it was enabled under the "carved out" version of IFRS adopted by EU. As for Czech Accounting Standards (CAS), the guidance is not clear. Based on discussions with several accounting experts, I doubt that fair value hedging can be applied. In this case, hedging of economic value without application of hedge accounting, would not only lead to the volatility of accounting P&L, it would also result in the volatility of tax base.

3.1. FV Hedging of Demand Deposits Under "Full IRFSs" and US GAAP

Full version of IAS 39 (see International Accounting Standards Board, 2006) states that „the fair value of a financial liability with a demand feature (e.g. a demand deposit) is not less than the amount payable on demand, discounted from the first date that the amount could be required to be paid" (see Paragraph 49), "consequently demandable liability cannot qualify for fair value hedge accounting for any time period beyond the shortest period in which the counterparty can demand payment" (see AG 118 and BC189).

This decision taken by International Accounting Standards Board (IASB) is further explained in IAS 39 – Basis for Conclusions (BC 187 and 188). IAS 39 only allows to apply fair value hedging to liabilities (assets) or firm commitments that exist today (in contrary to cash flow hedging, which may be applied also to highly probable forecast transactions). Demand deposit balances, even if expected to be stable in time, cannot constitute hedged item within fair value hedging framework, as "the balance of the portfolio is relatively stable only because withdrawals on some accounts (which usually occur relatively quickly) are offset by new deposits into others. Thus, the liability being hedged is actually the forecast replacement of existing deposits by the receipt of new deposits."

Similar explanation is delivered by Mary Barth (2006). She stresses that liability is defined as "a present obligation of the entity resulting from past events…," so fair value of demand deposits cannot contain value of future deposits. It may be probable that depositor will deposit more funds to replace those he withdraws and will have an account balance for a longer period, however, these new deposits are the result of future transactions, not past transactions, thus, the present liability definition doesn't include them. Mary Barth explains the fact that demand deposits are sold between banks for less than the amount to be paid on demand by existence of an asset representing the relationship with depositors,[13] which is however not under control of the entity, so it can't be recognized.

Similarly, US GAAP, Paragraph 12 of Statement of Financial Accounting Standards – SFAS 107 (see Financial Accounting Standards Board, 1991) states that „In estimating the fair value of deposit liabilities, a financial entity shall not take into account the value of its long-term relationships with depositors, commonly known as core deposit intangibles, which are separate intangible assets, not financial instruments. For deposit liabilities with no defined maturities, the fair value to be disclosed … is the amount payable on demand at the reporting date." On top of that neither core deposit intangible can be subject to fair value hedging under US GAAP as it is an unrecognized asset, which does not embody firm commitment (see Financial Accounting Standards Board, 1998 – SFAS 133, Paragraph 437 for details).

The approach chosen by IFRSs and US GAAP is quite controversial as it is inconsistent with banks risk management practices, which only understand balances of newly open demand deposit accounts as "new business"[14] and consequently attach relatively long durations to demand deposits. The choice of accounting standard is probably motivated by the difficulty to compute fair value and by the sensitivity of fair value to the choice of the model parameters.

3.2. FV Hedging of Demand Deposits Under IRFSs as Adopted by EU

European banking community protested heavily against paragraphs of IAS 39, which disable fair value hedging of demand deposits. After many rounds of discussions, Commission finally adopted IAS 39 with the exclusion ("carve-outs") of certain provisions relating to hedge accounting (and to full Fair Value Option), by Commission Regulation (EC) 2086/2004 of 19 November 2004. The Commission did not replace any of the provisions contained in the standard and neither did it add anything. One sentence, which has been carved out by European Commission from the paragraph AG 122, is particularly important: "It is not appropriate to assume that changes in the fair value of the hedged item equal changes in the value of the hedging instrument." This carve-out significantly facilitates application of hedge accounting.

Since the adoption of the "carved-out" version of IAS 39 by EU, there has been an intense dialogue between European Banking Federation (EBF) (2008) and IASB, aiming at removing the "carve-outs" and at the same time facilitating continuation of current ALM (asset and liabilities management) practices without leading to the undesired volatility of accounting P&L or equity accounts. European Banking Federation has proposed so called "Interest Margin Hedge"

[13] In fact, this is exactly "core deposit intangible" described also in US GAAP.

[14] They argue that future replacement is a consequence of the relationship with the depositor, which has been established in the past.

(IMH) methodology, which is based on the current ALM practices and is also supported by international supervisors. At session held during the IASB meeting on 13 December 2006, IASB made clear that a third hedging methodology could not be envisaged. Discussions were going on also in 2007, however no final consensus has been reached.

3.3. Other Alternatives for Application of Hedge Accounting

Even if demand deposits cannot represent hedged item in fair value hedging framework (under full IFRSs and US GAAP), IFRSs don't restrict treatment of demand deposits for risk management (ALM) purposes. When applying replicating portfolio models (RPMs), an entity may for example schedule part of demand deposits as 10 years fixed rate liability. As a result, it may figure out, that there is a gap between one month fixed rate assets and 10 years fixed rate liabilities and hedge it via 10 years receive fix interest rate swap.

Fair value hedging may be applied, if there is a different 10 years fixed rate liability, which may be designated as a hedged item in a fair value hedging relationship. Alternatively cash flow hedging may be applied, if there is a suitable floating rate asset (firm commitment or forecast transaction), which may be designated as a hedged item in a cash flow hedging relationship. In other words, if the derivative transaction is in line with entity's risk management objectives, IAS 39 doesn't primarily investigate, whether the "correct" economic position is hedged or not. Once the hedged position and the type of hedge accounting have been specified and documented, it must "only" be periodically proven that the hedging item has been and is still expected to be highly effective in offsetting changes of fair value/cash flows on the hedged item and other criteria for application of hedge accounting are met.

As a consequence, usage of RPMs may be consistent with relatively low volatility of accounting P&L, even if interest rate derivatives are used for hedging of interest rate exposures – but only in the case that "suitable hedged position can be found". In this case the ultimate goal – stability of accounting P&L may be reached. In other cases, hedges by derivatives, which would be suitable from risk management perspective, remain either unrealized or lead to the artificial volatility of accounting P&L

At the same time, it must be emphasized that using RPMs only leads to the stabilization of net interest margin rather than economic value. It is hardly possible to hedge economic value of demand deposits and at the same time to ensure that profit or loss from the hedged and hedging item impact income statement in the same period and thus to systematically target low volatility of accounting P&L under full IFRSs and US GAAP.

Conclusion

Demand deposits play an important role for commercial banks as they represent relatively reliable funding base as well as a source of income (they are remunerated bellow market rates, sometimes even at zero rates). At the same time, it must be stressed that demand deposits are also responsible for significant part of volatility of P&L (both economic and accounting).

Hedging of demand deposits may follow so called earnings perspective or economic value perspective. The goal of the economic value perspective is very ambitious as it aims to protect economic value of the bank, compared to the earnings perspective, which "only" targets the stabilization of accounting P&L. Both methods depend very much on the assessment of joint behaviour of banks, which set the interest rates paid on demand deposits, and clients, who decide to withdraw or deposit money to their accounts. As it is very complicated to estimate this joint behaviour, especially for distant future, both perspectives face the same source of uncertainty.

However the uncertainty is much more visible when following the economic value perspective, as the corresponding models go in a deeper detail than replicating portfolio models (RPMs), which don't aim to fully describe all optionalities, which are connected with demand deposits. At the same time, when following economic value perspective, hedging is more costly as either complex options are used or hedging portfolio is frequently adjusted (when applying delta hedging).

In the current mixed attribute accounting model, where demand deposits are measured at amortized costs and can not be subject to FV hedging (at least in "full IFRSs" and US GAAP), it is almost impossible to hedge the economic value and at the same time to ensure that profit or loss from the hedged and hedging item impact income statement in the same period and thus to target low volatility of accounting P&L.

As a consequence, many banks still prefer RPMs as they promise reasonable stability of accounting P&L and don't require usage of excessively complicated models, which are complex to design and parameterize and whose stability in the changing environment is questionable.

But in some cases, even when using RPMs, "suitable hedged position" cannot be found and so hedges by derivatives, which would be suitable from risk management perspective, remain either unrealized or lead to the artificial volatility of accounting P&L.

References

ADAM, A. – HOUKARI, M. – LAURENT. J.-P. (2006): Hedging Interest Rate Margins on Demand Deposits. Lyon: Université Lyon 1. BNP Paribas and ISFA Actuarial School.

BARTH, M. (2006): Including Estimates of the Future in Today's Financial Statements. [BIS Working Paper, No. 208,] Basel: Bank for International Settlements.

Basel Committee on Banking Supervision (2004): Principles for the Management and Supervision of Interest Rate Risk. Basel: Bank for International Settlements.

BERKOVEC, J. A. – MINGO, J. J. – ZHANG, X. (1997): Premiums in Private versus Public Branch Sales. [Finance and Economic Discussion Series, 97 – 33.] Washington, DC: Federal Reserve Board.

Česká Spořitelna, a. s. (2007): Výroční zpráva 2006. <www.csas.cz>.

Československá obchodní banka, a. s. (2007): Výroční zpráva 2006. <www.csob.cz>.

DEWACHTER, H. – LYRIO, M. – MAES, K. (2006): A Multi-Factor Model for the Valuation and Risk Management of Demand Deposits. [NBB Working Paper No. 83 – Research Series.] Brussels: National Bank of Belgium.

ELLIS, D. M. – JORDAN, J. V. (2001): The Evaluation of Credit Union Non-Maturity Deposits. [Working paper.] Washington, DC: National Economic Research Associates.

European Banking Federation (2008): IASB Exposure Draft on Exposures Qualifying for Hedge Accounting. [Enclosure to Letter N. 0011, 10. 01. 2008.] Brussels: European Banking Federation.

Financial Accounting Standards Board (1991): Statement of Financial Accounting Standards No. 107, Disclosures about Fair Value of Financial Instruments. Norwalk, CT: Financial Accounting Foundation.

Financial Accounting Standards Board (1998): Statement of Financial Accounting Standards No. 133, Accounting for Derivative Instruments and Hedging Activities. Norwalk, CT. Financial Accounting Foundation.

FRACHOT, A. (2001): A Note on Behavioral Models for Managing Optionality in Banking Books. Groupe de Recherche Opérationnelle. Lyon: Crédit Lyonnais.

FRAUENDORFER, K. – SCHŰRLE, M. (2003): Management of Non-Maturing Deposits by Multistage Stochastic Programming. European Journal of Operational Research, *151*, pp. 602 – 616.

HUTCHISON, D. – PENNACCHI, G. (1996): Measuring Rents and Interest Rate Risk in Imperfect Financial Markets: The Case of Retail Deposits. Journal of Financial and Quantitative Analysis, *31*, pp. 399 – 417.

International Accounting Standards Board (2006): International Financial Reporting Standards 2006. London: IASCF Publications Department.

International Accounting Standards Board (2007): Information for Observers. [Board Meeting: 17 October 2007, Project: Financial Instruments, Subject: Application of Portfolio Cash Flow Hedge Accounting to Interest Rate Exposures.] London: International Accounting Standards Committee Foundation.

JANOSI, T. – JARROW, R. A. – ZULLO, F. (1999): An Empirical Analysis of the Jarrow-van Deventer Model for Valuing Non-Maturity Demand Deposits. Journal of Derivatives, *7*, Fall, pp. 8 – 31.

JARROW, R. A. – van DEVENTER, D. R. (1996): Disease or Cure? Risk, 9, No. 2, pp. 23 – 26.

JARROW, R. A. – van DEVENTER, D. R. (1998): The Arbitrage-Free Valuation and Hedging of Deposits and Credit Card Loans. Journal of Banking and Finance, *22*, pp. 249 – 72.

JONG, F. – WIELHOUWER, J. (2001): The Valuation and Hedging of Variable Rate Savings Accounts. [Tinbergen Institute Discussion Paper.] Amsterdam: University of Amsterdam – ING Group and CentER – Tilburg University.

Komerční banka, a. s. (2007): Výroční zpráva 2006. <www.kb.cz>.

KURITZKES, A. – SCHUERMANN, T. (2007): What we Know, Don't Know and Can't Know about Bank Risk: A View from the Trenches. In: DIEBOLD, F. X. and HERRING, R. J. (eds.): The Known, the Unknown and the Unknowable in Financial Risk Management. Princeton: Princeton University Press.

MAES, K. – TIMMERMANS, T. (2005): Measuring the Interest Rate Risk of Belgian Regulated Savings Deposits. Financial Stability Review, 2005. Brussels: National Bank of Belgium, pp. 137 – 151.

O'BRIEN, J. M. (2000): Estimating the Value and Interest Rate Risk of Interest-Bearing Transactions Deposits. [Working Paper.] Washington, DC: Division of Research and Statistics, Board of Governors of the Federal Reserve System.

Office of Thrift Supervision (2001): The OTS Net Portfolio Value Model. Washington, DC: Department of the Treasury, Office of Thrift Supervision.

SELVAGGIO, R. D. (1996): Using the OAS Methodology to Value and Hedge Commercial Bank Retail Demand Deposit Premiums. In: FABOZZI, F. and KONISHI, A. (eds.): The Handbook of Asset/Liability Management. Chicago: Probus Publishing, Chapter 12, pp. 363 – 373.

SHEEHAN, R. G. (2004): Valuing Core Deposits. Notre Dame: Department of Finance – University of Notre Dame.