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Off-balance sheet activities and the assessment of off-balance sheet credit risk management in the banking sector of the Czech Republic

Abstract

This article is focused on the off-balance sheet activities of the Czech banking sector and the management of credit risk resulting from these activities. Off-balance sheet activities became very important part of the banking business. The nominal value of off-balance sheet several times exceeds the value of balance sheet assets. The importance of off-balance sheet activities has been increasing and it is necessary to manage the risks of these activities. There are many risks resulting from off-balance sheet activities. One of the most important risks is credit risk. That is why, it is necessary to manage credit risk joined with off-balance sheet activities. The aim of this article is to assess off-balance sheet credit risk in the banking sector of the Czech Republic. For this purpose, an expected loss of off-balance sheet activities is calculated. Expected loss depends on probability that the counterpart do not meet its obligation (probability of default). Calculation of probability of default is based on Build-Up Method. The article is conceived as a study of off-balance sheet activities in the Czech Republic. It explains the conception of the off-balance sheet activities in the Czech Republic. Then, the accounting principles, its characteristic features and regulatory rules are recognized. The last part of the article is devoted to the assessment of the credit risk management in the area of off-balance sheet activities in the Czech Republic.

Keywords: banking sector, off-balance sheet, credit risk management, banking regulation, credit conversion factor.
JEL Classification: G21, G28, G32.

Introduction

Off-balance sheet (OBS) activities are a special category of bank activities. They represent the operations which are not evidenced in the bank balance sheet. However, this definition is not sufficient. That is because some of the OBS activities are evidenced simultaneously in the balance sheet and off-balance sheet. The typical examples are futures, forwards or options. These derivative instruments are recorded in the balance sheet in their real value and in the off-balance sheet in their nominal value.

As the off-balance sheet activities are future potential balance sheet assets, they are joined with a certain level of credit risk. After agreed conditions are met and the off-balance sheet asset transforms into the balance sheet asset, there is a probability that the counterpart will not fulfill its obligation (e.g. pays his debt). Credit risk becomes the most evident risk in the case of these off-balance sheet instruments that are direct credit equivalents (Basel Committee on Banking Supervision). This relates, for example, to the open credit lines, given commitments, etc. The lowest (or zero) level of credit risk is related to the values in custody or asset management. Except this, the level of credit risk depends also on the revocability of the commitments and guarantees. If they are revocable, the level of credit risk is relatively small. On the other hand, if they are irrevocable, the level of credit risk is relatively high (Basel Committee on Banking Supervision).

Credit risk has to be taken into account by the bank. It should be included into risk management process of the bank and expected losses should be calculated.

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1. Theory discussion

The issue of off-balance sheet activities is relatively frequent part of scientific literature concerning banking problems. However, there can be observed a different attitude of particular authors to the off-balance sheet – their definition and categorization. Some of the authors treat them as bank activities evidenced in accounting – off-balance sheet statement. Other authors comprehend off-balance sheet activities in wider sense, i.e. activities evidenced in accounting plus services that are not receivable in accounting statements – payments, sale of non-bank products (e.g. insurance products), investment advisory, etc.

Among the Czech authors engaged in off-balance sheet activities of commercial banks can be included, for example:

1. Dvořák, P. Bankovnictví pro bankéře a klienty (Banking for bankers and clients)[1],
2. Mejstřík, M. Basic principles of banking[2],
3. Polouček, S. Bankovnictví (Banking)[3],
4. Půlpánová, S. Komerční bankovnictví v České republice (Commercial banking in the Czech Republic)[4].

Czech authors are focused almost exclusively on the description of off-balance sheet activities and their categories. There is not many publication devoted to the off-balance sheet activities in terms of their risk management or principles of regulation.

[1] Dvořák, P. (2005). *Bankovnictví pro bankéře a klienty*, Prague: Linde.
[2] Mejstřík, M. (2008). *Basic Principles of banking*, Prague: Karolinum.
[3] Polouček, S. (2006). *Bankovnictví*, Prague: C. H. Beck.
[4] Půlpánová, S. (2007). Komerční bankovnictví v České republice, Prague: Oeconomica.

In foreign scientific literature, there can be found many publications dealing with bank off-balance sheet activities. It should be pointed out that the conception of them is quite different from the conception of the Czech authors. Foreign authors much more tend to the wider conception of off-balance sheet activities. The different attitude to off-balance sheet activities is quite influenced by the accounting principles and legislation in the certain country (mainly the differences between IAS[1] and GAAP[2]).

Foreign publications focused (among others) to characteristics of off-balance sheet activities or their risk management are, for example, the following:

1. Bessis, J. Risk Management in Banking[3],
2. Gestel, T., Baesens, B. Credit Risk Management[4],
3. Heffernan, S. Modern Banking[5],
4. Meir, K. Financial Institutions and Markets and Money[6], Banking and Financial Markets[7],
5. Rose, P. S., Hudgins, S. C. Bank Management & Financial Services[8].

2. Importance of the research

Even though, the article is focused on the bank activities that are not evidenced in the bank balance sheet – but "only" off-balance sheet – it is very important to assess credit risk resulting from these activities. From the value point of view, the off-balance sheet activities are much more important than their balance sheet counterparts. In 2011, the Czech aggregated banking off-balance sheet assets reached about 6,694 billions of CZK, aggregated banking off-balance sheet liabilities were about 10,051 milliards of CZK, while aggregated banking balance sheet assets were 4,476 milliards of CZK. Larger volume of Czech aggregated banking off-balance sheet than balance sheet can be observed in more than 10 last years.

Beside this, off-balance sheet are seen as an originator of a worldwide financial crisis which begun in 2007 in the USA. American banks transferred their balance credit exposures into off-balance sheet credit instruments and which were undertaken by various financial investors (pension funds, insurance investors etc.). However, these financial investors underestimated credit risk joined with these off-balance exposures and suffered high losses[9]. That is why off-balance sheet credit risk should not be ignored.

3. Regulation of off-balance sheet activities

The Czech banking sector is relatively highly regulated. It is one of the most regulated sectors of the Czech economy. The regulatory rules applied in the Czech banking sector are based on the harmonized rules established by the Basel Committee on Banking Supervision (BCBS) that issued regulatory frameworks known as Basel I, Basel II and Basel III. In 2008, the implementation of Basel II into Czech legal framework was finished. The implementation of Basel III will be completed in 2019.

The implementation of European directions No. 2006/48/ES and 2006/49/ES (known as regulatory framework Basel II) was done by the Decree No. 123/2007 Coll., which came into legal force at the beginning of 2008.

Except this, commercial banks have to fulfill legal obligations stated by the Accounting Act No. 563/1991 Coll. and the Decree on Accounting No. 501/1992 Coll. These legal sources establish accounting rules in accordance with the International Accounting Standards/International Financial Reporting Standards (IAS/IFRS).

The role of regulatory authority in the banking sector plays the Czech National Bank (CNB). CNB is a central bank with regulatory and supervision power over the whole financial system (banking, insurance, capital market and others).

4. Methodology of credit risk measurement of off-balance sheet activities

In Czech Republic, the commercial banks can choose one of two approaches to credit risk measurement [Petrjánošová, 2004, p. 56]:

1. *Methods based on absolute position in credit risk*, which calculate total volume of asset facing the credit risk.
2. *Methods based on expected rate of default on credit receivables*, where the level of expected loss influenced, except others, by the probability of client's default.

According to Basel II, the banks can use for calculation of credit risk capital requirement one of three approaches: standardized approach; foundation internal ratings-based approach; advanced internal ratings-based approach[10].

The expected loss (EL) of credit receivable in accordance with one of the IRB approach is calculated as follows:

$$EL = PD \cdot LGD \cdot EAD\,, \tag{2}$$

where *EL* is the expected loss, *PD* is the probability of default, *LGD* is the loss given default, *EAD* is the exposure at default.

[1] International Accounting Standards.
[2] Generally Accepted Accounting Principles.
[3] Bessis, J. (2002). *Risk Management in Banking*, Hoboken, N. J.: Wiley.
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[8] Rose, P.S., Hudgins, S.C. (2010). *Bank Management & Financial Services*, Boston: McGraw-Hill.
[9] For more information see publications at [6].
[10] IRB approaches can be used after the consent of CNB.

As because the off-balance sheet activities are just potential credit receivables it is necessary to take into account the probability of OBS exposure conversion to balance sheet exposure. The probability is expressed by credit conversion factor:

$$EL = PD \cdot LGD \cdot EAD \cdot CCF\ , \quad (3)$$

where *CCF* is the credit conversion factor.

Credit conversion factors of OBS items are determined by Annex 20 to Decree No. 123/2007 Coll. The Annex 20 contains credit conversion factors, coefficients and methods applied in the calculation of capital requirements relating to credit risk in the trading portfolio and market risk. Credit conversion factors are valued from 0 to 100%.

5. Assessment of the off-balance sheet credit risk management in the Czech banking sector

The assessment of the OBS credit risk management in commercial banks in Czech Republic will be proved on a model example. The model example will be based on real data of one of the biggest commercial banks in Czech Republic – Komerční banka (KB).

5.1. Input parameters. Expected loss will be calculated for off-balance sheet exposures of Komerční banka for one year period from December 31, 2010. On December 31, 2010 Komerční banka had off-balance sheet exposures in these sectors.

Table 1. Off-balance sheet exposures of Komerční banka on December 31, 2010 (in CZK millions; %)

Sector	Volume	Share
Construction industry	47,879	24.29 %
Power plants, gas plants and waterworks	16,166	8.20 %
Wholesale	15,289	7.76 %
Banking and insurance industry	16,915	8.58 %
Transportation, telecommunication and warehouses	8,435	4.28 %
Manufacturing of other machinery	15,325	7.78 %
Public administration	10,511	5.33 %
Food industry and agriculture	7,461	3.79 %
Chemical and pharmaceutical industry	4,341	2.20 %
Metallurgy	6,118	3.11 %
Other processing industry	5,544	2.81 %
Retail	6,903	3.50 %
Automotive industry	1,234	0.63 %
Manufacturing of electrical and electronic equipment	2,089	1.06 %
Others	32,890	16.69 %
Total	197,100	100.00 %

Source: Annual Report of KB (2010).

The expected loss will be calculated for OBS exposures in particular sectors and for the sum of them.

The components of equation (3) will be determined as follows.

Exposure at default (EAD) expresses the total value (of an asset) that a bank is exposed to when the default occurs (at a time of default).

The basis for its determination is the value of OBS exposures of KB. In the model example, it is supposed that only 80% of the value of OBS exposures will the bank face in time of default. It means that EAD will be the following.

Table 2. EAD for particular sectors (in CZK millions)

Sector	EAD
Construction industry	38,303
Power plants, gas plants and waterworks	12,933
Wholesale	12,231
Banking and insurance industry	13,532
Transportation, telecommunication and warehouses	6,748
Manufacturing of other machinery	12,260
Public administration	8,409
Food industry and agriculture	5,969
Chemical and pharmaceutical industry	3,473
Metallurgy	4,894
Other processing industry	4,435
Retail	5,522
Automotive industry	0,987
Manufacturing of electrical and electronic equipment	1,671
Others	26,312
Total	157,680

Source: Author's calculation.

Loss given default (LGD) expresses the amount of fund that the bank looses in case of default. Generally, LGD is dependent on a recovery rate. The higher recovery rate, the lower LGD is. Thus, LGD depends on the hedging of potential balance sheet exposures (pledge, collaterals, etc.).

For the purpose of the model example, LGD is determined in respect to rating agency Moody's. In the document published by Moody's in June 2009 "*Rating Methodology. Probability of Default Ratings and Loss Given Default Assessments*" (Moody's), the agency uses standard value of LGD 50% for subjects (debtors) with low probability of default. This standard value of LGD is based on the historical experiences of the agency. The model example will calculate with LGD of 50%.

Credit conversion factor (CCF) reflects a probability with which the off-balance sheet item becomes balance sheet item. CCF has values from the interval 0% to 100%[1].

[1] In some cases, the value of CCF can be out of this interval. For example, in case of a clerical error made by a bank when a client is able to draw a credit over the agreed limit (for more information, see [30, p. 176]).

Commercial banks have two possibilities for setting CCF. They can determine CCF by themselves on the basis of their own internal credit ratings. Or, they can use conversion factors stated by Basel Committee (while applying standardized approach). In practice, the Czech commercial banks use primarily values of conversion factors stated by Basel Committee. Usage of own calculations is very rare.

Then, in the model example, the determination of CCF will be based on the standardized approach and the value of CCF will be 20%. This value is stated for off-balance sheet assets with the maturity up to 1 year[1].

Probability of default (PD) means the probability the client will not meet his obligation in paying the debt. There are several methods for estimation of PD (Bessis, 2002). They are based on the assessment of the customer's credit quality (bonity).

In this model example, the PD is calculated on the basis of Build-Up Method for calculation of equity costs by Mařík (Mařík, 2007, pp. 236-245).

Build-Up Method is one of the most important tools for business valuation. In principle, the method is consisted in calculation of risk premium and adding this risk premium to a risk-free rate. The risk premium is the sum of partial risk premiums.

Build-Up Method consists of three steps:

1. Definition of risk factors.
2. Valuation of risk factors.
3. Transformation of the risk factors to risk premiums.

PDs are calculated for each of 14 economic sectors listed in Table 1 (for principles of PC calculation see Bučková (2011)).

Table 3. Resulting PD for particular sector (in %)

	Construction	PGW	Wholesale	BII	TTW	MOM	PA
PD	1,657	0,433	1,548	0,430	1,504	1,216	0,208
	FIA	CPI	ME	OPI	Retail	AI	MEEE
PD	0,690	0,523	0,456	1,029	1,502	1,860	1,552

Notes: PGW – Power plants, gas plants and waterworks; CPI – Chemical and pharmaceutical industry; BII – Banking and insurance industry; TTW – Transportation, telecommunication and warehouses; ME – Mining and extraction; OPI – Other processing industry; MOM – Manufacturing of other machinery; AI – Automotive industry (i.e. except of automotive vehicles); PA – Public administration; FIA – Food industry and agriculture; MEEE – Manufacturing of electrical and electronic equipment.
Source: Author's calculation.

6. Results

Expected loss (EL) is calculated for three model situations of off-balance sheet assets. In each case, the structure of the OBS assets are the same, only the weights of each asset differ. In the first case, the weight of each OBS asset is the same as KB had on December 31, 2010. It is the real situation. The other two cases are fictive. Thus, the OBS assets in the second case is less risky (each sector with PD over 1% shares no more than 5% of the OBS total value, each sector with PD up to 1% shares more than 10% of the OBS total value). The third case is more risky (each sector with PD over 1% shares more than 8% of the OBS total value and each sector with PD up to 1% shares no more than 2.5% of the OBS total value).

The results are contained in the following tables. PD of the item "others" is calculated as a simple (unweighted) average of the particular sector PDs.

Table 4. EL calculation in the case 1 (in millions of CZK, in %)

	Weight	PD	EAD	LGD	CCF	EL
Construction	24.29%	1.657%	38,303.20	50%	20%	63.47861
PGS	8.20%	0.433%	12,932.80	50%	20%	5.605693
Wholesale	7.76%	1.548%	12,231.20	50%	20%	18.93966
BII	8.58%	0.430%	13,532.00	50%	20%	5.81731
TTW	4.28%	1.504%	6,748.00	50%	20%	10.14796
MOM	7.78%	1.216%	12,260.00	50%	20%	14.90567
PA	5.33%	0.208%	8,408.80	50%	20%	1.752455
FIA	3.79%	0.690%	5,968.80	50%	20%	4.116858
CPI	2.20%	0.523%	3,472.80	50%	20%	1.816214
ME	3.11%	0.456%	4,894.40	50%	20%	2.233838
OPI	2.81%	1.029%	4,435.20	50%	20%	4.564384
Retail	3.50%	1.502%	5,522.40	50%	20%	8.292587
AI	0.63%	1.860%	987.20	50%	20%	1.835981

[1] Assets with maturity more than 1 year have value of CCF 50%.

Table 4 (cont.). EL calculation in the case 1 (in millions of CZK, in %)

	Weight	PD	EAD	LGD	CCF	EL
MEEE	1.06%	1.552%	1,671.20	50%	20%	2.593486
Others	16.69%	1.043%	26,312.00	50%	20%	27.45593
Total	100.00%	-	157,680.00	-	-	173.5566

Source: Author's calculation.

Table 5. EL calculation in the case 2 (in millions of CZK, in %)

	Weight	PD	EAD	LGD	CCF	EL
Construction	5.0%	1.657%	7,884.00	50%	20%	13.06589
PGS	12.5%	0.433%	19,710.00	50%	20%	8.543254
Wholesale	4.0%	1.548%	6,307.20	50%	20%	9.766517
BII	13.0%	0.430%	20,498.40	50%	20%	8.812115
TTW	4.0%	1.504%	6,307.20	50%	20%	9.485065
MOM	4.0%	1.216%	6,307.20	50%	20%	7.668276
PA	12.0%	0.208%	18,921.60	50%	20%	3.943399
FIA	11.0%	0.690%	17,344.80	50%	20%	11.96322
CPI	11.5%	0.523%	18,133.20	50%	20%	9.483348
ME	10.0%	0.456%	15,768.00	50%	20%	7.196624
OPI	3.0%	1.029%	4,730.40	50%	20%	4.868182
Retail	3.0%	1.502%	4,730.40	50%	20%	7.103298
AI	1.0%	1.860%	1,576.80	50%	20%	2.932511
MEEE	1.0%	1.552%	1,576.80	50%	20%	2.44699
Others	5.0%	1.043%	7,884.00	50%	20%	8.226763
Total	100.00%	-	157,680.00	-	-	115.5055

Source: Author's calculation.

Table 6. EL calculation in the case 3 (in millions of CZK, in %)

	Weight	PD	EAD	LGD	CCF	EL
Construction	12.0%	1.657%	1,8921.60	50%	20%	31.35813
PGS	2.0%	0.433%	3,153.60	50%	20%	1.366921
Wholesale	11.5%	1.548%	18,133.20	50%	20%	28.07874
BII	1.0%	0.430%	1,576.80	50%	20%	0.677855
TTW	8.5%	1.504%	13,402.80	50%	20%	20.15576
MOM	9.0%	1.216%	14,191.20	50%	20%	17.25362
PA	1.0%	0.208%	1,576.80	50%	20%	0.328617
FIA	1.0%	0.690%	1,576.80	50%	20%	1.087566
CPI	2.0%	0.523%	3,153.60	50%	20%	1.649278
ME	2.5%	0.456%	3,942.00	50%	20%	1.799156
OPI	8.0%	1.029%	12,614.40	50%	20%	12.98182
Retail	9.5%	1.502%	14,979.60	50%	20%	22.49378
AI	13.0%	1.860%	20,498.40	50%	20%	38.12265
MEEE	11.0%	1.552%	17,344.80	50%	20%	26.91689
Others	8.0%	1.043%	12,614.40	50%	20%	13.16282
Total	100.00%	-	157,680.00	-	-	217.4336

Source: Author's calculation.

In case 1 (the real value of off-balance sheet assets of KB), EL reached 173.5566 millions of CZK. In case 2, EL was 115.5055 millions of CZK. And in case 3, EL reached the highest value, i.e. 217.4336 millions of CZK.

The results itself have no information value. So as to be able to assess the impact of OBS credit risk onto the bank's business, we have to compare the resulting ELs with economic variables – profits, provision for off-balance sheet commitments and total value of OBS assets. In 2010, KB profits reached 12.035 millions of CZK and provision for off-balance sheet commitments of KB was 461 millions of CZK.

While concerning the case 1, the EL represents 0.09% of total value of OBS assets. It means also 1.44% of profits and 37.64% of provision for OBS commitments. As the provision is high enough for covering expected losses, we can say that the structure of OBS assets is convenient. OBS credit risk exposures of KB are well-managed.

Cases 2 and 3 allow us to assess fictive situations when the bank bears lower or higher level of credit risk.

In low-risk situation represented by the case 2, the resulting EL reached 0.059% of total OBS assets value. It was also 0.96% of profits and 25.05% of provision.

In high-risk situation represented by the case 3, the resulting EL reached 0.11% of total OBS assets value, which was also 1.8% of profits and 47.16% of provision.

Even if the bank run the high risk, as modeled in the case 3, the provision is high enough to cover the potential losses from credit risk.

The result is that KB is well-managed with satisfactory credit risk management of OBS exposures.

Conclusion

Off-balance sheet activities are specific type of bank operations. By providing these activities, banks face many kinds of risks. One of the most important risks is the credit risk. This risk results from the uncertainty that the potential future credit receivables would be repaid (i.e. the debtor properly meets his obligation). Credit risk can be quantified as an "expected loss" (EL) which the bank suffers from the credit operation. The base of the EL calculation is the same as in case of credit receivables. It is not sure, however, that off-balance sheet asset will be turned to balance sheet asset (credit receivable). This uncertainty has to be included into calculation. The calculation of EL has to be enhanced by a factor representing probability with which the off-balance sheet asset will be transferred to balance sheet asset. This probability is expressed by "credit conversion factor" (CCF).

Czech commercial banks do not usually calculate CCF. They take standardized CCFs that are stated by Basel Committee (BCBS).

In this article, an assessment of off-balance sheet credit risk management was conducted. For this purpose, an off-balance sheet of Komerční banka which is one of the largest commercial banks in the Czech Republic is issued. According to the results of the assessment, Komerční banka has a convenient structure of its off-balance sheet activities with good diversification into particular economic sectors. The bank creates a provision for off-balance sheet commitments which is sufficient for potential loss of off-balance sheet activities. In my opinion, the credit risk resulting from off-balance sheet activities is well managed in the Czech banking sector.

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