IFRS 9 FINANCIAL INSTRUMENTS AND CREDIT RISK MODELING IN BANKS

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Abstract: For nearly a decade, the International Accounting Standards Board (IASB) has been aware of the need to change the requirements for financial reporting of financial instruments in order to increase the relevance and readability of the information on them in the financial statements.

During the financial crisis, a significant weakness of the rules for valuation of financial instruments was highlighted, related to the delayed recognition of impairment losses on loans and other financial instruments. These shortcomings gave rise to the need to adopt an entirely new impairment model in IFRS 9 Financial Instruments - A Model of Expected Losses. The model was developed in response to the G20's call for a forward-looking approach to recognizing expected losses on financial assets. This report analyses the new general approach of expected impairment losses on financial assets, as adopted in the final version of IFRS 9 Financial Instruments. Although the report is of a strong theoretical and methodological nature, much of the conclusions drawn can contribute to the comprehension of specific provisions of the Standard and support their practical application.

1. Introduction

The new standard IFRS 9 Financial Instruments came into force since 1 January 2018 and replaced IAS 39 Financial Instruments. IFRS 9 (EU, 2018) contains requirements for the classification, measurement and recognition of financial assets and financial liabilities, impairment of financial assets and accounting for hedges. The impairment approach is the most significant area of change as per IFRS 9 compared to IAS 39. IFRS 9 adopts the model of expected impairment losses - unlike IAS 39, which is based on the model of incurred losses (Stoyanov, St., *et al.,* 2018). According to the Expected Credit Losses (ECL) model, an entity must recognize the ECL at any time and update the amount of the ECL recognized at each reporting date to reflect changes in the credit risk of the financial instruments. Credit risk is usually explained as the risk that a borrower may not repay a loan (or any type of debt) so the lender may lose the principal of the loan or the interest on the loan, or both. Credit risk is also called "a default risk" because it implies a Probability of Default.

The model is forward-looking and occurrence of loss event is not required to recognize impairment losses. In accordance with IFRS 9, the following instruments are subject to impairment (EU, 2018, par. 5.5.1): debt instruments measured at amortized cost; debt instruments measured at fair value through other comprehensive income; loan commitments and financial guarantee contracts that are not measured at fair value through profit or loss; lease receivables within the scope of IAS 17 Leasing; contract assets within the scope of IFRS 15 Revenue from Contracts with Customers (rights to consideration after the transfer of goods, products or services).

Equity instruments and financial assets measured at fair value through profit or loss are not subject to impairment (MNP, 2017).

Although impairment rules in IFRS 9 apply to all mentioned categories of financial assets, in practice three different approaches are introduced depending on the type of asset and its credit risk: a general approach (three-tier); simplified approach (for trade receivables, lease receivables and contract assets with clients without

significant financial component; for instruments with significant financial component-optional); approach to purchased or initially created financial assets having credit impairment.

Under the IFRS 9 framework, banks are required to develop models to estimate expected losses. The objective of this paper is to focus on the practical challenges the financial institutions would face and on how the existing available information and resources can be efficiently utilized.

2. Framework of General Impairment Approach.

The purpose of the general impairment approach, as adopted in the final version of IFRS 9 Financial Instruments, is to reflect the change in the credit quality of financial instruments. The amount of the expected credit losses recognized as an impairment allowance depends on the credit risk of the instrument at its initial recognition and on the change in credit risk in subsequent reporting periods. IFRS 9 requires an entity to evaluate ECL with reasonable and supportable information available (Singh, V.B., 2016) without undue expense and effort, and it includes historical, current and forecast information. „In practice, this may not be a complex analysis, in some cases relatively simple modelling may be sufficient without the need for large-scale and detailed simulation of different scenarios." (Milanova, E., 2016) Typical of the standard is that the impairment is calculated based on the following indicators:

• Probability of Default (PD) – two PD estimates are calculated: 12-month PD and PD for the entire period of the credit

• Loss Given Default (LGD)

Definitions:

Probability of default – probability of whether borrowers will default on their obligations (takes into account credit risk and time value of money)

Loss Given Default – estimate of the loss on a transaction given that a default occurs (takes into account collateral)

For the purpose of impairment of financial instruments, three stages of credit risk deterioration were introduced, with specific reporting requirements provided for every stage. At each reporting date, the entity has to decide the stage to which a financial asset relates to, in order to apply the relevant requirements.

IFRS 9 requires the determination of a stage for each exposure, according to which a factor is applied in the impairment calculation either for a 12-month probability of default or for a probability of default for the entire life, as follows:

- Expected credit losses for 12 months (Stage 1) – the credit losses due to default events that are possible within the next 12 months. Those financial instruments that have not undergone a significant change in credit risk after initial recognition are included in Stage1.

- Expected credit losses over the entire life of the instrument (Stages 2 and 3) – the expected credit losses arising from all possible default events over the expected life of the instrument, weighted on the basis of their likelihood of occurrence. Stage 3 refers to financial instruments that have objective evidence of impairment while Stage 2 refers to instruments whose credit risk has increased significantly after their initial recognition, but for which there is still no objective evidence of impairment.

The difference in the accounting treatment of the instruments in Stage 2 and in Stage 3 consists of the way interest income on the instrument is recognized. In Stage 2, as well as in Stage 1, the amount of the recognized interest income is not related to the reported impairment loss at all. Interest is accrued on the basis of the gross carrying

amount of the instrument. In Stage 3, the interest is calculated on the basis of the amortized cost of the asset (gross carrying amount less any allowance for impairment).

Table no.1 presents the general framework used for the distribution of credits in the three different stages.

Table 1. IFRS 9 Staging Framework

	Stage 1	Stage 2	Stage 3
Level of Asset Risk	Same or not significantly deteriorated since initial recognition	Significantly deteriorated since initial recognition	Asset is in a situation of default
Impairment recognition	12-month ECL	Life-Time ECL	Life-Time ECL
Expected loss	12 month EL= 12 month PD x lifetime LGD	Lifetime EL = lifetime PD x lifetime LGD	Lifetime EL = lifetime PD x lifetime LGD
Exposure at default	Equivalent to performing loans	Equivalent to 'underperforming' loans but not yet impaired	Equivalent to 'non-performing'; and current incurred loss model under IAS 39
Interest revenue	Interest income recognised on gross basis	Interest income recognized on gross basis	Interest income recognized on net basis (net of provisions)

Expected credit losses are calculated by: (a) identifying scenarios in which a loan or receivable defaults; (b) estimating the cash shortfall that would be incurred in each scenario if a default was to happen; (c) multiplying that loss by the probability of the default happening; and (d) summing the results of all such possible default events (PwC, 2017).

Putting the theory into practice, the expected credit losses under the 'general approach' can be best described using the following formula:

Expected credit loss = Probability of Default (PD) x Loss Given Default (LGD) x Exposure at Default (EAD)

Definitions:

Exposure at Default (EAD) – estimate of the amount that will be outstanding at the date of default (takes into account amortization)

The Probability of Default (PD) used to calculate impairment for exposures at each stage is result of a statistical analysis of the behaviour of the granted loans. Input data for the analysis include the number of delinquencies occurring in the loan portfolio as of the date the loan was initially disbursed.

To calculate the impairment, LGD is also used obtained as a result of statistical analysis of the behaviour of the overdue granted loans. In this case, the input data for the analysis include collected amounts from borrowers between the default event and the loan maturity.

Considering the above aspects, the distribution of loans in 3 stages according to the risk level, as defined in IFRS 9, cannot be deduced on the basis of deteriorating credit behaviour (as tackled in the usual manner).

3. Model Implementation

Main issue of model implementation is the grouping of financial assets for impairment evaluation according to their risk characteristics (Ernst & Young, 2012). The criteria for the 3 stages was defined according to the presumptions determined in par.5.5.11 of IFRS 9, supplemented by quantitative and qualitative criteria indicating impairment of credit risk on loans granted. These criteria represented both receivables in terms of principals, interest, fees and penalty interest payable by borrowers that were booked in the statement of financial position and commitments for loans granted, but not yet utilized, booked off-balance sheet. Loans having no overdue or with no more than one overdue monthly instalment (payment of principal and/or interest), but for administrative reasons and not because of financial difficulties, were considered in Stage 1, with the exception of loans classified in Stage 2 based on indicators different from the number of overdue monthly instalments. As Stage 2 loans were reflected those for which one or more of the following indicators were present: delay of two consecutive monthly instalments (payments of principal and / or interest) or delay of one monthly instalment, but due to financial difficulties and not for administrative reasons; deterioration of the borrower's financial ratios; difficulties in servicing debt to third parties; increase in the amount of overdues; presence of blocked current accounts; increase in the total debt of the borrower; delay in the launch of the funded project or other factors with a negative effect on future cash flows. Loans with a delay of three or more consecutive monthly instalments (principal and/or interest payments) were considered in Stage 3 (default).

Table no.2 summarizes the staging definitions used for the impairment's methodology developed.

Table 2. Staging under IFRS 9

Stage 1	0 or 1 delay in principal and/or interest payments
Stage 2	2 consecutive delays in principal and/or interest payments and other qualitative and quantitative indicators pointing to deteriorated creditworthiness
Stage 3	3 or more consecutive delays in principal and/or interest payments

3.1. Probabilities of Default (PDs) Calculation

The 'general approach' has two bases, on which to measure the PD. The first base shall present the probability that a credit in Stage 1 would default in the next 12 months after the moment of observation (12-month PD). The second base shall represent the probability that a credit being in Stage 2 would fall into default during its full remaining history. These two estimations are forward-looking and based on historical information. For the purposes of their calculation, the full credit history of the bank is used.

In order to calculate 12-month PD, all credits being in Stage 1 as of every month of the history of the bank, as of the moment of the analysis, were followed for 12 months after being at Stage 1. One and the same credit being at Stage 1 during multiple points in time was considered multiple times in the PD calculation – the full history on a rolling basis was used.

As a next step, for each bucket of credits at Stage 1 at a given point in time the number of credits was counted that have defaulted during the next 12 months,

irrespective of the exact month. This calculation was performed on a rolling basis following one strict condition – once a credit falls in default, it is assumed to stay in the default state at least for the next 12 months.

After conducting these calculations, a 12-month moving average was calculated on a rolling basis for each point of observation (each month). In this way we got an adjusted 12-month PD value for each point of observation.

To calculate the final 12-month PD figure the average of the adjusted value from Step 3 for the last 2 years (24 months) was taken, with at least 12 months of history at the moment of the analysis.

Full calculations for Stage 1 PD are illustrated in Table no.3.

Table 3. Calculations for Stage 1 PD

Observation Point	Total Credits in Stage 1 at observation point	Defaulted in 12 Months	PD	12 months moving average adjusted PD	Country Rating (S&P)	Outlook
1 month	198	7	3.54	4.21	BB+	positive
2 month	195	8	4.10	4.18	BB+	positive
3 month	186	7	3.76	4.86	BB+	positive
4 month	183	8	4.37	4.62	BB+	positive
5 month	179	7	3.91	4.48	BBB-	stable
6 month	177	6	3.39	4.41	BBB-	stable
7 month	167	4	2.40	4.26	BBB-	stable
8 month	171	6	3.51	4.16	BBB-	stable
9 month	165	6	3.64	4.13	BBB-	stable
10 month	170	9	5.29	4.08	BBB-	stable
11 month	166	8	4.82	4.02	BBB-	positive
12 month	164	5	3.05	4.01	BBB-	positive
13 month	161	1	0.62	3.81	BBB-	positive
14 month	172	1	0.58	3.59	BBB-	positive
15 month	174	1	0.57	3.37	BBB-	positive
16 month	179	3	1.68	3.09	BBB-	positive
17 month	184	3	1.63	2.92	BBB-	positive
18 month	192	0	0.00	2.69	BBB-	positive
19 month	189	0	0.00	2.36	BBB-	positive
20 month	198	3	1.52	2.09	BBB-	positive
21 month	196	3	1.53	2.01	BBB-	positive
22 month	208	6	2.88	1.86	BBB-	positive
23 month	209	6	2.87	1.83	BBB-	positive
24 month	208	3	1.44	1.67	BBB-	positive
PD				3.45		

The final value for the 12-Month PD obtained in this process is 3.45%. Based on the same principle, PD for the full loan term was calculated.

To apply a similar approach, an estimate of the number of loans that are expected to reach Stage 2 (increased risk level) over the course of their full life in the bank portfolio is required.

Historical information was used to make this assessment. The Lifetime PD for the credits in Stage 2 was calculated respecting a similar procedure. All credits being in Stage 2 as of every month of the history of the bank, at the moment of the analysis, were followed for their full life after entering the Stage 2. One and the same credit being at Stage 2 at different points of observation was considered multiple times in the PD calculation.

Then for each bucket of credits at Stage 2, the number of credits that have defaulted during their remaining lifetime was counted. This calculation was performed on a rolling basis adhering to the condition that once a credit entered into default it would remain in default at least for the next 12 months.

After performing these calculations, a 12-month moving average was computed on a rolling basis for each point of observation (each month). In this way an adjusted Lifetime PD value for each point of observation was obtained.

To calculate the final Lifetime PD figure, the average of the adjusted value from step 3 was taken for the last 2 years (24 months), with at least 12 months of history at the moment of the analysis.

The full calculations for Stage 2 PD are shown in Table no.4.

Table 4 Calculations for Stage 2 PD

Observation Point	Total Credits in Stage 2 at observation point	Defaults in the lifetime of the credit	PD	12 months moving average Lifetime PD	Country Rating (S&P)	Outlook
1 month	5	1	20.00	56.67	BB+	positive
2 month	0	0	0.00	68.26	BB+	positive
3 month	3	2	66.67	58.06	BB+	positive
4 month	2	0	0.00	62.50	BB+	positive
5 month	0	0	0.00	53.33	BBB-	stable
6 month	0	0	0.00	55.17	BBB-	stable
7 month	2	2	100.00	54.17	BBB-	stable
8 month	0	0	0.00	56.00	BBB-	stable
9 month	0	0	0.00	55.00	BBB-	stable
10 month	0	0	0.00	52.63	BBB-	stable
11 month	2	0	0.00	53.33	BBB-	positive
12 month	3	3	100.00	47.06	BBB-	positive
13 month	3	3	100.00	47.06	BBB-	positive
14 month	0	0	0.00	66.67	BBB-	positive
15 month	0	0	0.00	66.67	BBB-	positive
16 month	0	0	0.00	66.67	BBB-	positive
17 month	0	0	0.00	80.00	BBB-	positive
18 month	3	3	100.00	80.00	BBB-	positive
19 month	0	0	0.00	84.62	BBB-	positive
20 month	0	0	0.00	81.82	BBB-	positive

Observation Point	Total Credits in Stage 2 at observation point	Defaults in the lifetime of the credit	PD	12 months moving average Lifetime PD	Country Rating (S&P)	Outlook
21 month	1	0	0.00	81.82	BBB-	positive
22 month	0	0	0.00	75.00	BBB-	positive
23 month	2	0	0.00	75.00	BBB-	positive
24 month	3	3	100.00	75.00	BBB-	positive
PD				**64.69**		

The final value for the lifetime PD for the credits in Stage 2 is 64.69%.

3.2. LGD Calculation

For the LGD (Loss Given Default) calculation only credits that have reached the stage of default and are already completed at the moment of the analysis were used. Considering the full history of the financial institution, 60 credits have reached default status, but 13 of them were still not completed at the moment of the analysis. Therefore, 47 credits in total qualified.

The most important criteria for LGD calculation was that only defaulted credits having reached 3 or more consecutive months with delays on interest and/or principal payments were considered as well as only credits, which were repaid at the time of the analysis. Furthermore, all payments made by the defaulted clients were discounted back to the moment the credit was granted and this was the third criterion. The discount rate consisted of four components. The first was the average interest rate of the loan during its lifetime as per books of the bank. In case the debtor ran out of money and the credit collateral remained the only possible source of recoveries, a risk premium was also used to compensate for the higher risk of collecting interest and principal from a defaulted customer (second component). A premium of 1.5% was the third component: for administrative and other costs of such nature related with the renegotiations and restructuring on some of the defaulted credits. The last factor was a premium of 5.5% to compensate for the cost of funds (alternative investments) and for future inflation expectations. This figure was based on the yield of the 10-year Bulgarian government bonds, as well as on the Consumer Price Index (CPI). The 10-year bond had a yield of 1.9% p.a. of the total figure and was based on the average yield for the last 3 years at the moment of the analysis. The CPI component represented 3.6% of the final figure and was calculated based on the average yearly inflation rate for the 12 months prior to the moment of the analysis.

Following the above considerations, all defaulted credits were examined on a discounted cash flow basis and all collections made on them were compared to the principal amount of the credit. All repayment components (principal, interest, as well as taxes and penalty interest) were included in the cash flow figures. The differences were averaged among all the credits and the resulting figure of 35% was considered as the LGD estimation for the credits issued by the enterprise.

The aggregated calculation at credit level can be seen in Table no.5.

Table 5. LGD Calculation

Credit Number	Total Repaid Discounted	Principal Due	Loss	Percentage Loss
13	626,977	1,254,132	-627,155	-50%
20	850,578	1,600,000	-749,422	-47%
45	681,653	1,296,090	-614,438	-47%
50	364,534	491,992	-127,458	-26%
63	236,366	236,366	0	0%
80	454,219	972,477	-518,258	-53%
101	1,270,533	1,800,000	-529,467	-29%
109	1,521,991	2,530,855	-1,008,864	-40%
113	977,392	1,642,062	-664,670	-40%
175	613,176	780,949	-167,773	-21%
257	1,586,403	2,229,336	-642,933	-29%
263	1,514,316	2,011,905	-497,589	-25%
313	82,642	128,423	-45,781	-36%
375	395,654	676,659	-281,005	-42%
411	310,495	527,939	-217,444	-41%
413	257,256	341,500	-84,244	-25%
419	159,944	209,675	-49,731	-24%
422	110,954	142,890	-31,936	-22%
461	207,111	290,000	-82,889	-29%
469	133,719	154,600	-20,881	-14%
471	1,936,110	2,817,109	-880,999	-31%
498	496,539	767,036	-270,497	-35%
508	601,964	1,200,000	-598,036	-50%
568	273,476	400,000	-126,524	-32%
577	468,392	849,486	-381,094	-45%
631	1,224,816	1,851,213	-626,396	-34%
648	137,366	304,000	-166,634	-55%
652	3,695,824	5,667,755	-1,971,931	-35%
653	1,871,673	3,000,000	-1,128,327	-38%
692	973,927	1,220,000	-246,073	-20%
705	117,578	328,483	-210,904	-64%
707	151,370	332,615	-181,245	-54%
732	750,789	1,187,286	-436,497	-37%
752	121,390	169,285	-47,895	-28%
785	2,309,682	3,500,000	-1,190,318	-34%
787	130,332	221,483	-91,151	-41%
799	1,267,174	1,726,039	-458,865	-27%
811	54,380	120,601	-66,221	-55%
833	360,345	421,116	-60,771	-14%
857	1,686,482	2,500,000	-813,518	-33%
884	620,150	861,104	-240,954	-28%

Credit Number	Total Repaid Discounted	Principal Due	Loss	Percentage Loss
886	235,127	477,000	-241,873	-51%
891	123,882	244,058	-120,176	-49%
899	98,909	131,573	-32,664	-25%
936	39,042	48,950	-9,908	-20%
966	30,503	46,541	-16,038	-34%
976	77,358	120,360	-43,002	-36%
Average		**1,060,233**	**-374,903**	
LGD			**-35%**	

3.3. Provisioning Coefficients' Calculation

The impairment coefficients were calculated and applied based on the relationship, where the expected credit loss is the product of the probability of default, the loss-given default and the exposure at default.

Table no.6 presents the calculated coefficients and expected impairment amounts.

Table 6. Impairment Amounts

	Stage 1	Stage 2	Stage 3
Definition	Credits currently with 0 or 1 month interest or principal sum in default	Credits with 2 consecutive months of interest and/or principal defaults	Credits with 3 or more consecutive months of interest and/or principal defaults
PD	3.45%	64.69%	100.00%
LGD	35%	35%	35%
Impairment Coefficient	1.21%	22.64%	35.0%
Exposure	128,345,766 BGN	13,420,392 BGN	841,472 BGN
Impairment Amount	1,547,978 BGN	3,038,677 BGN	294,515 BGN

4. Conclusion

This paper offers a solution for implementing the most difficult part of the new IFRS 9, i.e. the model for calculation of Expected Credit Losses for financial instruments. Both theoretical and practical instructions for defining, determining and computing all three variables in the ECL formula were presented. The coefficients calculated in this way can be modified by updating the data or, if necessary, in case of change in the loan portfolio of the bank. Impairment was computed at the end of each calendar year, with opportunity to analyse the impaired loan on a quarterly basis and to adjust the impairment amount if needed.

Recognition of Expected Credit Losses in the Statement of Financial Position (impairment/loss provisions) and in the Income Statement (expenses) can be either 12-month or lifetime for each financial asset, depending on the impairment stage, which the asset falls in. As soon as a financial instrument is purchased or originated, 12-month expected credit losses are recognized in profit or loss. Moreover, a loss allowance is established. This serves as a proxy for initial expectations of credit losses.

We believe the implementation of the ECL model will likely pose certain practical challenges in terms of information requirements and implementation costs. In this paper, the impairment model was covered with a focus on these challenges the banks would face as well as how the available information and resources can be efficiently utilized.

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