S&P Global
Market Intelligence

Using CreditPro® To Measure Credit Losses In Investment Portfolios For IFRS 9 And CECL Requirements

Michelle P Cheong
Director, Credit Solutions
S&P Global Market Intelligence

George Tripolitakis
Analyst, EMEA
Analytic Development Group
S&P Global Market Intelligence

Hangyu Ma
Senior Specialist
Analytic Development Group
S&P Global Market Intelligence

Background

After the global financial crisis in 2008, the G20 (Group of Twenty) tasked the International Accounting Standards Board (IASB) and Financial Accounting Standards Board (FASB) to develop a single set of high-quality global standards that would provide unbiased, transparent and relevant financial reporting to investors. Consequently, new financial instruments standards, such as the International Financial Reporting Standards 9 (IFRS 9) and Current Expected Credit Losses (CECL) were developed.

IFRS 9 will replace the current IAS 39; and will be implemented in several jurisdictions (including Europe and Canada). In the United States, where Generally Accepted Accounting Principles (GAAP) standards are currently in force, FASB finalized new accounting standards on “Recognition and Measurement” and “Expected Credit Loss” (ECL) of financial instruments, in January and June 2016 respectively.

IFRS 9 and CECL will have a significant impact on entities with sizeable financial assets and, in particular, on financial institutions. The implementation date for IFRS 9 is January 1, 2018 (earlier adoption date is permissible). The implementation date of CECL is (a) January 1, 2020 for listed institutions; and (b) December 31, 2021 for other institutions (earlier adoption will not be allowed until 2019).

We briefly review the requirements for calculating ECL for IFRS 9 and CECL in this paper; and highlight through a case study on how CreditPro® can be used to calculate ECL for financial instruments issued by corporations, financial institutions, etc.

Expected Credit Loss Methodology

The IASB and FASB do not prescribe specific methodologies to account for credit losses. Companies reporting earnings on GAAP and IAS (International Accounting Standards) can decide what credit risk models and data they use for ECL calculations as long as they adhere to stated principles of CECL and IFRS 9 respectively. We expect regulators, auditors and major financial institutions in each jurisdiction to potentially influence the market convention for ECL calculations within their jurisdictions, so that reported financial statements and capital adequacy ratios will eventually be comparable within applicable countries and regions.

Both IFRS 9 and CECL require a division of financial instruments into “stages” according to credit risk of these instruments (see Figure 1).

Figure 1: Summary of ECL calculations for IFRS 9 and CECL

	Stage 1 (IFRS 9 only)	Stage 2 (IFRS 9 and CECL)	Stage 3 (IFRS 9 and CECL)
What do these include	Instruments which are of low credit risk (e.g. investment grade instruments if rated).	For IFRS 9: Significant increase in credit risk (e.g. 30-day past due rebuttable assumption, transition of credit risk from investment grade to speculative grade, overlay by management based on idiosyncratic and macroeconomic conditions). For CECL: recognized at recognition.	All defaulted instruments (e.g. 90 day past due rebuttable assumption, default as defined by internal credit risk models, overlay by management etc.).
Period of measurement	ECL for a 12 month period. Need to assess Point-In-Time (PIT) PDs, incorporating (multiple) macroeconomic scenarios and other available forward looking information, as well as the time value of money.	Lifetime ECL. Need to estimate the full term structure of PDs until the maturity of the instrument, incorporating forward looking forecasts after year 1, as well as the time value of money.	Lifetime ECL.
Calculation	$ECL = \frac{EAD * PD * LGD}{1 + EIR}$	$ECL = \sum_t \frac{EAD_t * \text{Marginal}PD_t * LGD_t}{(1+EIR)^t}$	Since PD = 100% $ECL = \sum \frac{(EAD_t * LGD_t)}{(1+EIR)^t}$

Source: S&P Global Market Intelligence, as of January 4, 2017. For illustrative purposes only.

Where EAD = Exposure At Default, PD = Probability of Default, LGD = Loss Given Default, ECL = Expected Credit Loss, and EIR = Effective Interest rate of the Instrument

To facilitate the above ECL calculations of financial instruments to fulfill IFRS 9 and CECL's financial reporting requirements, S&P Global Market Intelligence currently offers the following data and models described in Figure 2[1]:

[1] Note: CreditModel™ and PD Fundamentals cover only Banks, Insurance, and Corporations. Other asset classes would require Credit Assessment Scorecards or Credit Ratings. Quantitative Loss Given Default (LGD) models for Asia are currently under development. LossStats® from CreditPro reports ultimate recovery of defaults through bankruptcy, restructuring etc. and is not based on the increase in pricing of fixed income instruments after default.

Figure 2: S&P Global Market Intelligence's capabilities for IFRS 9 and CECL

IFRS 9	STAGE 1	STAGE 2	STAGE 3
CECL	PERFORMING (STAGE 1)		DEFAULTED (STAGE 2)
Probability of Default (PD)	• **External Ratings** (at issuer and issue level) • **Credit Scorecards** (at counterparty and facility level) • **CreditModel™** (at counterparty level) • **PD Model Fundamental** (at counterparty level) • **CreditPro® Database** (actual default rates statistics) • **CDS Proxy spreads** (at counterparty level) • **PD Model Market Signals** (country and industry benchmarks) • *Macroeconometric model for Europe under development*		No estimation required (PD = 100%)
Loss Given Default (LGD)	• **Recovery Rate Scorecards** (at counterparty and facility level) • **CreditPro® Database** (actual recovery rates statistics) • Top-down statistical model for US (Europe under development)		
Data Warehouse and Reporting system	• **SNL Banker** (best-in-class reporting system that securely integrates data form several internal sources, such as bank's core processors, general ledger, and other systems for credit risk and other business purposes)		

Source: S&P Global Market Intelligence, as of January 4, 2017. For illustrative purposes only.

Note that external ratings and default datasets (such as CreditPro) by rating agencies are contemplated both under IFRS 9 and CECL:

IFRS (2014), B5.5.17, (e):
"[…] Internal credit ratings and internal behavioral scoring are more reliable when they are mapped to external ratings or supported by default studies."

CECL (2016), 326-30-50-7:
"[…] significant inputs used to measure the amount related to credit loss. Examples of significant inputs include, but are not limited to, all of the following: […] h. Credit Ratings

Source: S&P Global Market Intelligence, "The Interplay Of IFRS 9 And Basel Capital Requirements". This presentation paper was given at the RiskMinds International Conference, December 2016.

Six-step approach to calculating term structure of point-in-time PDs for entities

One essential component of the ECL calculation is the PD term structure over the life of the financial instrument. One approach to calculate point-in-time PDs can start with referencing a through-the-cycle entity credit rating; after which this credit rating is mapped to a through-the-cycle PD; and finally adjusted for the credit cycle to make that PD point-in-time.

In calculating ECLs for investment portfolios, we recommend an approach that is:

- Accurate in order of magnitude to reflect credit losses in aggregate.
- Can be based on entity credit ratings, which are available for many fixed income instruments[2]; since they are often used as inputs into investment and risk management processes.
- Easily automated and scalable. This is desirable for frequent (e.g. quarterly) routine credit risk updates for large investment portfolios, which do not require measurement of credit risk via Internal Ratings Based (IRB) models used for the commercial loan book.

[2] Note: If S&P Global Ratings is used, then this approach is more suited for countries in developed markets where we have significant coverage of S&P Global Ratings.

A six-step process for the implementation can be as follows:

Step 1: Measure through-the-cycle credit risk

IFRS 9 permits the use of external ratings such as S&P Global Ratings, if available. If S&P Global Ratings are not available, credit scores that are calibrated on S&P Global Ratings (e.g. CreditModel scores) can be used (see Appendix A for details).

IFRS (2014) B5.5.23

*"…*an entity may use its internal credit risk ratings or other methodologies that are consistent with a globally understood definition of low credit risk…. An external rating of 'investment grade' is an example of a financial instrument that may be considered as having low credit risk. However, financial instruments are not required to be externally rated to be considered to have low credit risk. They should, however, be considered to have low credit risk from a market participant perspective taking into account all of the terms and conditions of the financial instrument."

Source: "IFRS 9 Financial Instruments". Available on http://www.ifrs.org/IFRSs/Pages/IFRS.aspx

Step 2: Simulate future macro-scenarios to estimate impact on through-the-cycle credit risk from step 1

Step 3: Build term structure of through-the-cycle defaults using default history of S&P Global Ratings' rated entities

Step 4: Estimate point within credit cycle to calibrate "alpha" adjustment parameter (to be defined later)

Step 5: Map through-the-cycle PDs associated with credit ratings to point-in-time PDs via the alpha parameter across all relevant horizons of instruments

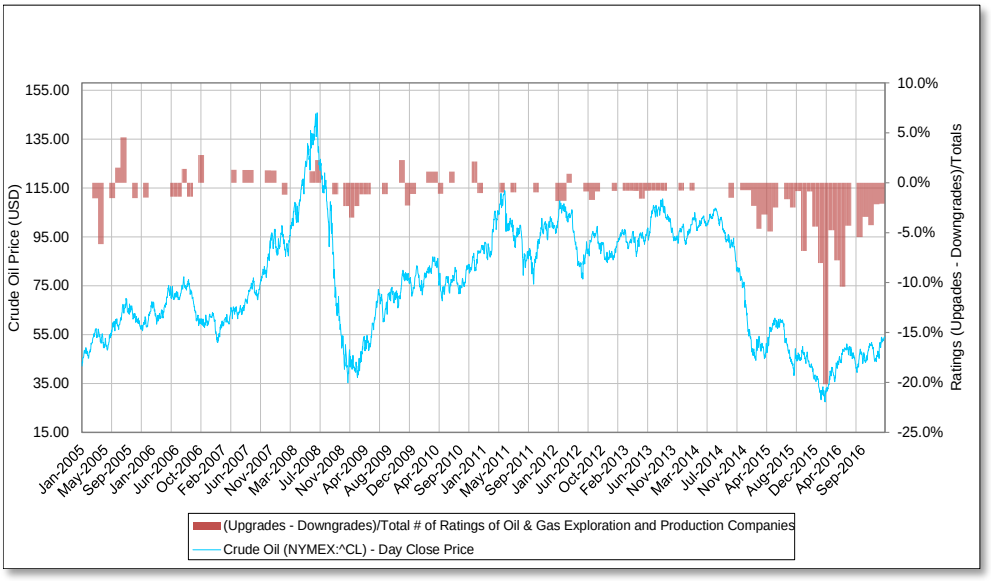
Step 6: Consider market indicators and other forward looking information and make necessary adjustments to PDs

For the rest of this document, we show how CreditPro can be used to perform steps 1 through 5. Step 6 requires data and analytics from Credit Analytics and RatingsDirect®.

CreditPro for Instruments rated by S&P Global Ratings: Case Study on ConocoPhillips (NYSE: COP)

In this paper, we highlight a case study on applying CreditPro for PD and LGD calculations for ConocoPhillips (NYSE: COP), a leading oil and gas exploration and production company in the United States. Oil and gas exploration and production companies' revenues are sensitive to oil prices which rose 194% from Jan 1, 2005 to July 31, 2008; and declined 57.2% from January 1, 2008 to Jan 2017 (see Figure 3).

Figure 3: Crude Oil Price Trends (NYMEX:^CL) vs. Ratings Trends of Oil and Gas Exploration and Production companies, from 2005 to 2016

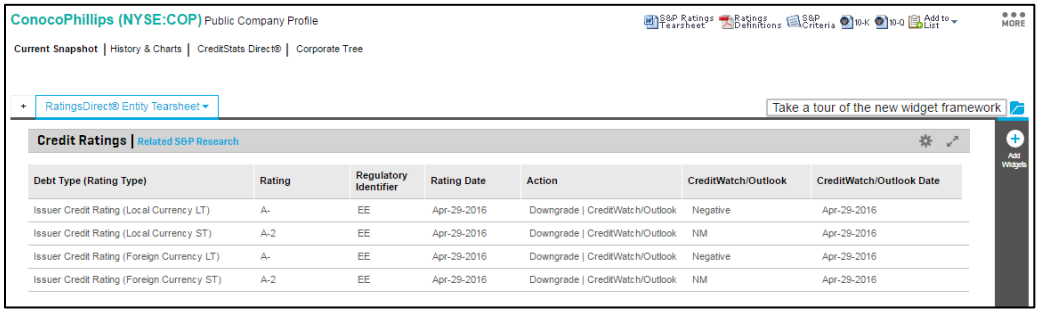


Source: S&P Capital IQ platform and CreditPro®, as of January 4, 2017. For illustrative purposes only.

Step 1: Measure Through-The-Cycle Credit Risk

ConocoPhillips is rated "A-/Negative" by S&P Global Ratings as of Jan 7, 2017 (see Figure 4).

Figure 4: Credit Ratings Summary from S&P Global Ratings for ConocoPhillips (NYSE:COP)



Source: RatingsDirect® on the S&P Capital IQ platform, as of January 4, 2017. For illustrative purposes only.

Step 2: Simulate future macro-scenario and see impact on through-the-cycle credit risk

If we want to simulate the impact of a macro-scenario on an instrument with a 3-year term structure, we can leverage CreditPro historical data and transition matrices, looking at an appropriate period. For example, if we are interested in simulating a future scenario of an oil price decline, we can replay rating transitions from 2008 to 2011 on energy companies, using a static pool from year 2008. To estimate the 3-year ahead through-the-cycle credit risk, we can use the transitions matrix as shown in Figure 5 below.

Figure 5: 3-year Ratings transitions matrix for the energy sector, static pool 2008

Rating	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC	C	D
AAA	100.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
AA+	0.00000	20.00000	0.00000	20.00000	0.00000	60.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
AA	0.00000	0.00000	70.00000	0.00000	20.00000	0.00000	10.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
AA-	0.00000	0.00000	0.00000	100.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
A+	0.00000	0.00000	0.00000	0.00000	100.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
A	0.00000	0.00000	0.00000	0.00000	9.09091	90.90909	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
A-	0.00000	0.00000	0.00000	0.00000	0.00000	10.00000	60.00000	20.00000	10.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BBB+	0.00000	0.00000	0.00000	0.00000	2.50000	2.50000	7.50000	57.50000	27.50000	0.00000	2.50000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BBB	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	14.28571	75.00000	10.71429	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BBB-	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	14.81481	77.77778	7.40741	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BB+	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	47.05882	35.29412	5.88235	5.88235	5.88235	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BB	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	4.34783	8.69565	69.56522	8.69565	4.34783	0.00000	0.00000	4.34783	0.00000	0.00000	0.00000	0.00000	0.00000
BB-	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	30.55556	30.55556	16.66667	11.11111	5.55556	0.00000	0.00000	2.77778	0.00000	0.00000	2.77778
B+	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	3.33333	0.00000	0.00000	0.00000	3.33333	6.66667	26.66667	16.66667	30.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	13.33333
B	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	8.69565	13.04348	47.82609	8.69565	8.69565	0.00000	0.00000	0.00000	0.00000	13.04348
B-	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	5.88235	0.00000	5.88235	29.41176	23.52941	11.76471	11.76471	0.00000	0.00000	0.00000	11.76471
CCC+	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	33.33333	0.00000	0.00000	0.00000	0.00000	0.00000	66.66667
CCC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	50.00000	0.00000	50.00000	0.00000	0.00000	0.00000	0.00000
CCC-	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
CC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
C	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Source: CreditPro® by S&P Global Market Intelligence, as of January 4, 2017. For illustrative purposes only.

Our historical experience shows that the credit quality of "A-" rated entities such as ConocoPhillips were relatively stable even as industry drivers deteriorated. The rating transition matrix indicates there was a 60% likelihood of entities rated as "A-" by S&P Global Ratings remaining at "A-" over a 3-year period starting from 2008; a 10% chance of upgrade and a 30% chance of downgrade. However, if this credit rating was say, "B+", then there was a 43% chance of a downgrade or default. Converting ratings grades to a numerical score from 1 to 22 such that SD/D =0, C = 1, CC = 2, etc., our expected numerical score would be 13.33% x 1 + 0% x 2 + … = 8.37 which can be mapped to the S&P Global Ratings grade of "B".

In order to derive the point-in-time PD based on S&P Global Ratings grades, we first build the term structure of through-the-cycle PDs. Then we determine the point within the credit cycle. Finally, adjust the through-the-cycle PDs to point-in-time based on the point within the credit cycle.

Step 3: Build term structure of through-the-cycle defaults using default history of S&P Global Ratings' rated entities

S&P Global Market Intelligence's Analytic Development Group[3] has constructed a term structure of cumulative default rates of all S&P Global Ratings scales through the credit cycle which best fit the observed defaults in the CreditPro database, subject to monotonicity constraints over time and across ratings scales. The smoothed term structure of default assumes, for example, the 2-year observed default rate within the same rating grade has to

[3] The Analytic Development Group is the quantitative research arm within S&P Global Market Intelligence, and is analytically independent from S&P Global Ratings.

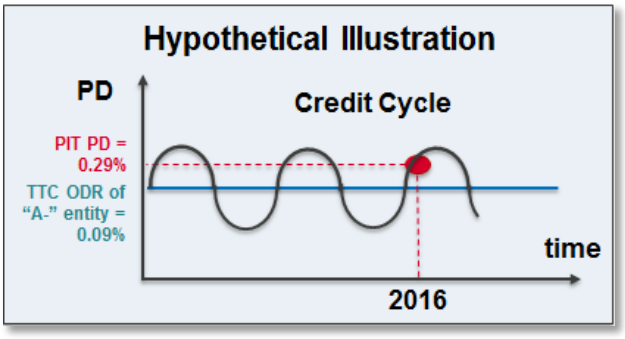
be higher than the 1 year observed default rate; and the observed default of an "A-" rated entity is higher than that of an "A" rated entity.

We can then look up this derived term structure of default rates to arrive at a 1-year through-the-cycle PD of an A- entity such as ConocoPhillips is 0.091%.

Step 4: Estimate point within credit cycle to calibrate "alpha" adjustment parameter

To gauge where the country is in the credit cycle, we compare the most recent default rates of the country/countries or industry/sector versus long term global average default rates across our global sample. This comparison is used to estimate the shift in the through-the-cycle term structure of default rates[4]. For example, if the recent observed default rate of the country is significantly higher than the long term average, then we assume that the credit cycle is deteriorating in the country (see Figure 6). We can make a simplifying and conservative assumption that the term structure of default rates for the instrument be shifted upwards across all time horizons; but that conservatively assumes that Observed Default Rates over longer time horizons move rigidly upwards. A more realistic assumption could be to only adjust PDs upward based on the average number of years Observed Default Rates have increased (i.e. the length of the credit cycle downturn); and leave the term structure unchanged in longer horizons.

Figure 6: Illustration of through-the-cycle to point-in-time adjustments of PDs of an entity rated "A-" by S&P Global Ratings



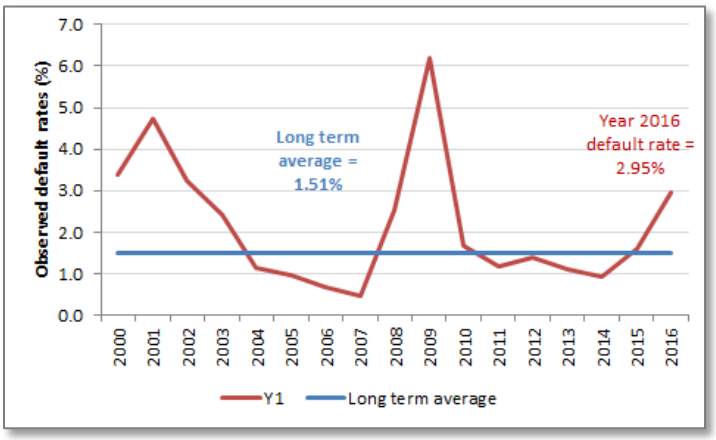
Source: S&P Global Market Intelligence, as of January 4, 2017. For illustrative purposes only.

Where PIT = Point-In-Time, TTC = Through-The-Cycle, ODR = Observed Default Rate

We discuss two plausible assumptions on point-in-time calibrations (See appendix for instances where global industry or sector PDs may be relevant). One assumption is that ConocoPhillips' credit risk depends on United States' credit cycle, since revenues from North America contributed to 62% of ConocoPhilipps' total revenues in 2015[5]. Figure 7 shows that credit risk in United States has recovered partially after the global financial crisis in 2008-2009; but has risen in 2016. The reasons for the recent increased in defaults despite stronger economic growth can be partially explained by an increase in GDP per capita from FY2009 onwards with a corresponding increase in Debt/EBITDA of corporates (Figure 8).

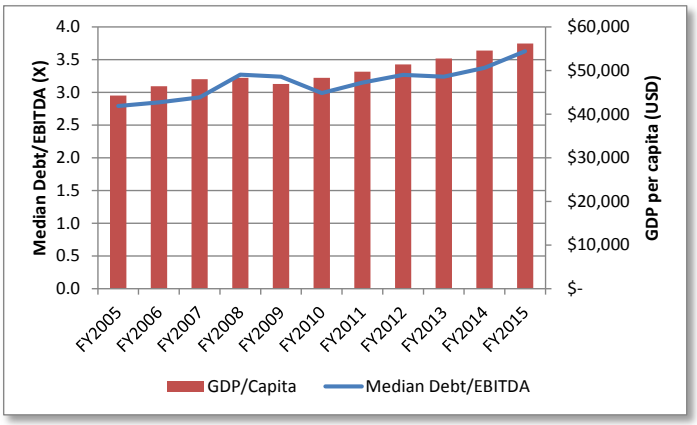
[4] We can also adjust credit cycles using industry default rates. This is described in the appendix.
[5] Percentage contribution of revenues or EBITDA by geography can be used to determine if the business is leveraged to the domestic, regional or global economy.

Figure 7: 1-year Observed default rates of S&P Global Ratings' rated entities in the United States vs. long-term average, static pool from 2000 to 2016



Source: CreditPro® by S&P Global Market Intelligence, as of January 26, 2017. For illustrative purposes only.

Figure 8: GDP per capita and median Debt/EBITDA trends in the United States (FY2005 to FY2015)



Source: Economic data from IHS Global Insight, offered on the S&P Capital IQ platform. Credit analyst adjusted financials from CreditStatsDirect on RatingsDirect® on the S&P Capital IQ platform. As of January 26, 2017. For illustrative purposes only.

We calibrate the "alpha" parameter which measures where we are in the credit cycle and drives how much we shift the PD term structure from through-the-cycle to point-in-time. The lowest possible value of a higher alpha parameter indicates that recent defaults significantly exceed long-term defaults and the credit cycle is in a steep downturn.

$$ODR_{2016} = \frac{1}{1+\left\{ODR_{LTaverage} \Big/ \left[1-ODR_{LTaverage}\right]\right\}^{-alpha}}$$

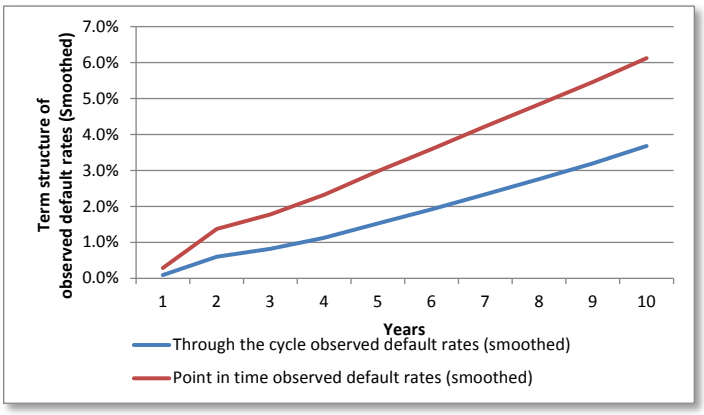
If we assume that the fundamental drivers of the company are similar to that of the United States, we plug in a short term default rate of 2.95% and a long-term default rate of 1.51%, resulting in an alpha parameter of 0.836.

Step 5: Map through-the-cycle PDs associated with the entity's credit rating or credit scores to point-in-time PDs via the alpha parameter across all relevant horizons of instrument

Using the alpha parameter in step 4 and the through-the-cycle observed default for an A-rated entity in step 3, the point-in-time estimate of 0.285%.

The smoothed term structure of cumulative defaults through-the-cycle and point-in-time for an A- entity is detailed below. We can extend this term structure up to 30+ years given our data history from 1981 onwards (see Figure 9).

Figure 9: Term structure of 1-year cumulative default rates for "A-" rated entity, using United States default rates



Source: CreditPro® by S&P Global Market Intelligence, As of January 16, 2017. For illustrative purposes only.

Step 6: Consider market indicators and other forward looking information

IFRS 9 provide a non-exhaustive list of information to assess changes in credit risk (see Appendix B5.5.17(c)). These include changes in market indicators such as credit spreads, Credit Default Swap (CDS) spreads, and other market information related to the borrower, such as changes in the price of a borrower's debt and equity instruments.

CDS Spreads

On CDS market indicators, S&P Global Ratings offers market indicators via CDS spreads for each ratings scale (see Figure 10).

Figure 10: CDS Benchmarks for each S&P Global Ratings scale

S&P Market Indicators - CDS Benchmarks

CDS Benchmarks by Rating Level

Ratings	Today	1 Day	7 Days	30 Days	90 Days	1 Y	2 Y	3 Y
CCC	1,604.84	1,663.71	1,788.18	2,202.94	2,319.05	4,102.10	4,703.09	3,733.80
CCC+	1,189.47	1,220.33	1,277.70	1,485.04	1,591.75	2,718.56	2,568.28	2,066.15
B-	881.60	895.12	912.94	1,001.09	1,092.54	1,801.66	1,402.50	1,143.33
B	653.42	656.57	652.32	674.86	749.90	1,194.00	765.88	632.68
B+	503.29	506.12	506.25	529.06	567.57	905.56	633.92	553.67
BB-	387.65	390.15	392.89	414.76	429.57	686.80	524.70	484.53
BB	298.58	300.75	304.91	325.16	325.13	520.88	434.29	424.03
BB+	223.76	225.31	228.05	241.71	240.57	370.55	305.95	307.68
BBB-	167.69	168.79	170.56	179.67	178.00	263.60	215.53	223.25
BBB	125.67	126.45	127.57	133.56	131.70	187.52	151.84	161.99
BBB+	103.48	104.15	105.03	109.22	107.61	148.53	119.50	127.07
A-	85.21	85.78	86.47	89.31	87.93	117.65	94.05	99.67
A	70.16	70.66	71.19	73.03	71.84	93.19	74.02	78.18
A+	64.38	64.76	65.21	66.40	64.59	83.07	65.70	68.42
AA-	59.07	59.35	59.73	60.37	58.06	74.06	58.31	59.88
AA	54.20	54.40	54.71	54.88	52.20	66.02	51.76	52.40
AA+	40.05	40.18	40.49	40.70	38.48	45.55	37.56	40.97
AAA	29.60	29.68	29.96	30.18	28.36	31.43	27.25	32.04

Source: RatingsDirect® on the S&P Capital IQ platform, as of January 26, 2017. For Illustrative Purposes Only.

Applying the above benchmark on Figure 10 to ConocoPhillips, the CDS Proxy adjustment from the previous quarter:

- Today: 85.21 bps
- Previous period 90 days ago: 87.93 bps
- Period-to-period % change: -3.093%
- 1-year point-in-time PDs for "A-" entity = 0.28562%
- 1 year point-in-time PDs for "A-" entity after adjusting for CDS spreads = min(0.28562% x 85.21/87.93,100%) = 0.2768%

If we want to use CDS spreads of the entity for a company specific market indicators of changes in credit quality, we can compare the deviations between CDS based market indicators from S&P Global Ratings. Figure 11 shows how we convert ConocoPhillips Ltd.'s 5-year CDS spread into a lower case credit score of "bbb+", which is one notch away from the Long Term Foreign Currency rating of "A-". However, the "Z-score"[6] indicates that, with volatility adjustment, this CDS indicator is only 0.40 standard deviations away from Ratings[7], and is not statistically different from S&P Global Ratings (Figure 12). There is no further need to adjust the point-in-time PDs and increase provisions for ECL.

[6] Note: the "Z-score" here denotes the number of standard deviations the CDS Market Derived signal deviates from S&P Global Ratings of that entity, and should not be confused with the "Altman's Z-score" used for measuring credit risk.
[7] A rule of thumb for a significant deviation would be +/- 1.96 standard deviations away from Ratings.

Figure 11: Market Derived Signals based on CDS Spreads vs. S&P Global Ratings of ConocoPhillips Ltd. Jan 2014 to Jan 2017

Source: RatingsDirect® on the S&P Capital IQ platform, as of January 26, 2017. For Illustrative Purposes Only.

Figure 12: Sample of Volatility adjusted CDS Market Derived Signals Z-scores history for ConocoPhillips

Entity Indicators History

Indicator Type: CDS Market Derived Signal

Score Date	Score	Z-Score
Jan-24-2017	bbb+	0.40
Jan-23-2017	bbb+	0.40
Jan-20-2017	bbb+	0.30
Jan-19-2017	bbb+	0.40
Jan-18-2017	bbb+	0.50
Jan-17-2017	bbb+	0.40
Jan-16-2017	bbb+	0.40
Jan-13-2017	bbb+	0.40
Jan-12-2017	bbb+	0.40

Source: RatingsDirect® on the S&P Capital IQ platform, as of January 26, 2017. For Illustrative Purposes Only.

Equity-based signals

If relevant CDS spreads and benchmarks are not available, we can potentially use PD measures based on equity volatility.

S&P Global Market Intelligence offers PD Model Market Signals, which is an advanced statistical model that generates market-driven PD values for publicly listed companies, using equity price and volatility. In addition, benchmark values are generated on a daily basis, including median PD value by industry and/or by country[8].

We look at the average of US daily benchmarks from PD Model Market Signals over the past 90 days and in 2016, to determine the corresponding adjustment with a formula similar to Step 4.

$$ODR_{A-,2016} = \frac{1}{1+\left\{0.2856\%/\left[1-0.2856\%\right]\right\}^{-1.1212}} = 0.1407\%$$

[8] Using benchmarks, the same technique can be applied to private companies.

After the inclusion of the market-based adjustment, the lifetime PD can be recalculated by a rigid shift of the term structure of PDs calculated in Step 5.

Conclusion

In this paper we have reviewed the requirements for calculating ECL for IFRS 9 and CECL; and highlighted with a case study how CreditPro can be used to adjust PDs for ECL calculations:

CreditPro can be used to (a) simulate macroeconomic scenario impacts on credit risk; (b) map through-the-cycle credit ratings or credit scores to the through-the-cycle PDs; and (c) further make point-in-time adjustments by looking at the difference between long term and short term average default rates. We also used CreditPro to build the full term structure necessary for the lifetime calculations of ECL. This process can be repeated considering multiple macroeconomic scenarios (usually involving a base case, a negative and a positive scenario), to obtain an overall PD that is averaged over multiple scenarios.

As shown in figure 1, to complete the calculation of ECL, we will also need (a) the exposure at default (EAD); and (b) the Loss Given Default (LGD). The EAD is provided by the reporting company. To assess LGD, we can use historical recovery statistics such as Recovery Analytics from CreditPro; statistical LGD Models on the S&P Capital IQ Platform; or LGD scorecards which include qualitative factors.

As IFRS 9 only requires the measurement of ECL to reflect (a) a probability-weighted outcome; (b) the time value of money; and (c) “reasonable and supportable information that is available without undue cost or effort”, in practice multiple approaches exist to calculate ECL. A company can estimate ECL from statistical models (e.g. CreditModel), expert judgment models (e.g. Risk Solutions Scorecards), or even mapping their own internal ratings to the S&P Global Ratings scale etc. These estimates are more reliable when they are mapped to external ratings or supported by default studies. Users have discretion on (a) how to adjust through-the-cycle PDs to point-in-time PDs; (b) which macroeconomic scenarios are most appropriate; and (c) how to systematically adjust their PDs according to each scenario.

In terms of market indicator adjustments, IFRS 9 is not prescriptive in the types of indicators used and approach; and allows for fixed income or equity based indicators. We can use CDS benchmarks or equity based market signals to introduce forward looking market information.

This paper suggests a simple six step process that can be used to satisfy the reporting requirements of IFRS 9 regarding ECL calculations. This six-step process uses S&P Global Ratings, credit scores that are calibrated on S&P Global Ratings and CreditPro datasets. We find this approach accurate; supported by S&P Global Ratings and default studies; and scalable.

Appendix A:
CreditPro for Instrument not rated by S&P Global Ratings

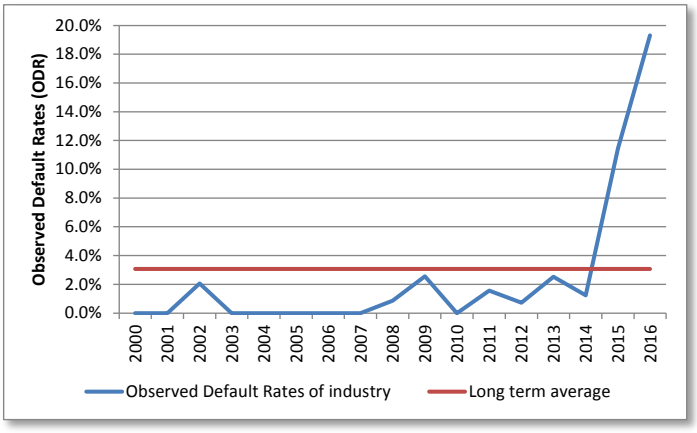
For entities which are not rated by S&P Global Ratings, a non-exhaustive list of approaches to arrive at a through-the-cycle credit score include:

- Perform mappings via CreditModel scores
- Request relevant mappings provided by Ratings agencies to meet Basel III requirements (e.g. http://www.taiwanratings.com/portal/front/showCustomArticle/bdbf8b833900d45e01392d1e7d2a00ef).
- Utilize relevant mappings provided by regulators, if available (e.g. https://eiopa.europa.eu/Publications/Consultations/Draft%20Mapping%20Report%20-%20JCRA.pdf).
- Perform a mapping between the ratings scales of local ratings agencies to the S&P Global Ratings' scale via observed default rates. The observed default rates of entities rated by S&P Global Ratings are available on CreditPro. (Source: https://www.eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/-/interactive-single-rulebook/toc/504/article-id/1402;jsessionid=634323CD7A6724D827BB3ABAAD2E6CF4). In this case, the definition of default for the internal model needs to be consistent with that of S&P Global Ratings' definitions.

Appendix B:
Considerations for commodities and energy sectors

In the above analysis, we assumed the main systemic driver of ConocoPhillips's credit risk was the US economy. If we take the view that ConocoPhillips's credit risk is more sensitive to global energy prices, we can calibrate point-in-time PDs using the global Oil &Gas Exploration and Production credit cycle instead.

Figure 13: 1-year Observed default rates of S&P Global Ratings' rated entities in the Oil & Gas Exploration & Production industry vs. long-term average, static pool from 2000 to 2016

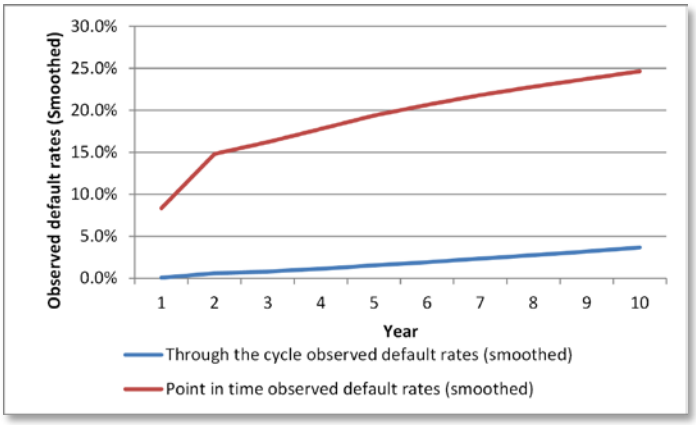


Source: CreditPro® by S&P Global Market Intelligence, as of January 26, 2017. For illustrative purposes only.

In this case, default rates of this sector have spiked significantly over the past year compared to the past, indicating that the oil & gas exploration and production sector is experiencing a sharp downturn; and defaults were rising dramatically (see Figure 13).

Consequently, the point-in-time cumulative observed default rates were significantly higher than their long term averages. Applying this point-in-time adjustment shifts the point-in-time PDs upwards significantly indicating that default risks increase significantly even for A- rated entities, even as the risks of default for this entity is lower than the speculative grade entities. These differences in marginal PDs attenuate after year 2 (see Figure 14).

Figure 14: Term structure of cumulative default rates for "A-" rated entity, using industry default rates



Source: CreditPro® by S&P Global Market Intelligence, Research from the S&P Global Market Intelligence Analytical Development Group, S&P Global Market Intelligence. As of January 26, 2017. For illustrative purposes only.

For companies which depend both on the regional economy and global sectors, we can use a weighted average of PDs based on both industry and economic cycles. We can potentially use the geographical and industry split of EBITDA or Revenues within these companies to fine tune the weights of industry, country and regional PDs.

Appendix C: Estimate point within credit cycle using industry default rates for Step 4

In a previous study[9], we found significant systemic effects within the following industries using PD Model Fundamentals and PD Model Market Signals from Credit Analytics.

- Energy
- Materials
- Transportation
- Semiconductors and Semiconductor Equipment
- Pharmaceuticals

For these sectors, we can use historical defaults from related industries or sectors in place of/in addition to regional defaults to estimate the industry's point within the credit cycle. We can uncover systemic effects via default correlations in CreditPro. Industries whose credit cycles are likely to be linked to global industries would generally have higher default correlations with themselves.

9 "Detecting Credit Risks from Industry and Global Credit Risk Spillovers via Extended Credit Surveillance (March 28, 2014).

Figure 14: Partial view of issuer default correlations heat-map from year t to year t+1 (1990 to 2016)

Industry	Energy and Natural Resources
Energy and Natural Resources	4.90
Financial Institutions	0.42
Transportation	0.20
Real Estate	0.14
High Tech/Computers/Office Equipment	-0.10
Utility	-0.10
Leisure Time/Media	-0.16
Aerospace/Automotive/Capital Goods/Metal	-0.17
Health Care/Chemicals	-0.24
Forest & Building Products/Homebuilders	-0.32
Insurance	-0.35
Consumer/Service Sector	-0.42
Telecommunications	-0.74

Source: "Detecting Credit Risks from Industry and Global Credit Risk Spillovers via Extended Credit Surveillance (March 28, 2014)"

S&P Global
Market Intelligence

CONTACT US

Americas
+1 877 863 1306

Asia Pacific
+852 2533 3565

Europe, Middle East
and Africa
+44 (0) 20 7176 1234